GILA RIVER BASIN

ARIZONA

SECTION 7 STUDY FOR MODIFIED ROOSEVELT DAM, ARIZONA

(THEODORE ROOSEVELT DAM)

HYDROLOGIC EVALUATION OF WATER CONTROL PLANS

SALT RIVER PROJECT TO GILA RIVER AT GILLESPIE DAM

U.S. ARMY CORPS OF ENGINEERS

LOS ANGELES DISTRICT

MARCH 1996

PREFACE

The title "Modified Roosevelt Dam" is used throughout this report to refer to Theodore Roosevelt Dam, modified structurally as authorized under PL 95-578 and shown on Plate 4, to include an additional allocation of water supply space, a new allocation for flood control, and additional surcharge space, along with new outlets works and spillway configuration. The reservoir formed by Modified Roosevelt Dam is referred to as "Theodore Roosevelt Lake" throughout this report.

Most drainage area computations referred to within this report are based upon subarea delineations conducted for the 1982 Central Arizona Water Control Study Hydrology Report and listed in Table 7 of that document. These delineations represent effective drainage area only, and may be in disagreement with drainage areas from other sources which report total area. The drainage areas listed for locations downstream of the Salt River and Verde River confluence are rounded. The drainage area for the Gila River at the mouth is consistent with data published by the United States Geological Survey for the Gila River at Dome, which excludes all closed basins except Aubrey Basin in the Verde River watershed, and is not based upon the effective drainage areas determined as mentioned above.

The water control plans presented within this report, especially the Recommended Plan, were formulated to correspond with the various release mechanisms provided by the Bureau of Reclamation designers for Modified Roosevelt Dam. Accordingly, steps include a hydroelectric turbine capacity of 2200 ft^3/s, a River Outlet Works capacity of 12,200 ft^3/s, and a limitation of 41,000 ft^3/s on the right spillway when making releases without the use of the left spillway. However, after the initial draft of this report was published, it has come to the attention of the Los Angeles District that there may be some revision to these release capabilities. For example, the turbine capacity varies with head and had not yet been established, and long-duration releases exceeding 25,000 ft^3/s should not be made from the right spillway alone. It has never been the position of the Los Angeles District to instruct the operators of Modified Roosevelt Dam on the means of making flood releases, but rather our objective has been to establish the release steps in a sequence which is compatible with the outlets as well as with beneficial aspects of the operation (e.g. hydropower production), As a consequence, the water control plan schedules presented within this report (Table 4) include releases for ranges of water surface elevations, but do not specify the facilities by which these releases are to be made. Furthermore, in the discussion in Chapter III, Section C, concerning the formulation of the water control plans, general recommendations are made for the purpose of example only, to present a means by which the scheduled releases might be made. Based upon further testing of the turbines and the River Outlet Works, along with ad hoc conditions, the operators of Modified Roosevelt Dam will select the best means of making the scheduled releases during periods when the lake level is ≥ elevation 2151, the top of the water supply pool.

Peak frequency discharges at locations downstream of the Salt River Project were developed by simulation of the operation of the project with historical events and by channel routing and *combining local intervening flow with simulated reservoir releases. These simulations were performed using a computational time-step of 6 hours. Hence, all downstream peak frequency discharges presented within this report represent the maximum 6-hour average flow rate, rather than an instantaneous value. The use of this time step for a basin with such a large drainage area is adequate. Hydrologic investigations conducted to support the 1982 Central Arizona Water Control Study indicated that the ratio of instantaneous peak discharge to the maximum 6-hour average value was about 1.04 to 1.05 for the range of flows considered. Since the Standard Project Flood was routed using 1-hour computation steps it can be used as an example:*

the peak 1-hour discharge for the Standard Project Flood at Granite Reef Diversion Dam based upon the water control plan recommended within this report is 1.4% greater than the maximum 6-hour average value. Although, for floods which emanate from the Verde River and undergo less regulation, the ratio of the instantaneous value to 6-hour average value will be greater, the use of the maximum 6-hour average values for the range of simulated historical events is adequate.

The location "below the confluence of the Salt and Verde Rivers" may also be referred to as "at Granite Reef Dam" in this study, since these locations are equivalent from a hydrologic viewpoint.

Finally, deviation from the recommended plan may result in discharge and elevation frequency relationships which are inconsistent with those presented herein, and may also result in water being stored above elevation 2151 for longer periods than were evaluated in the EIS.

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF TABLES

TABLE OF CONTENTS (continued)

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF FIGURES

LIST OF FIGURES

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF FIGURES

TABLE OF CONTENTS (continued)

LIST OF FIGURES

TABLE OF CONTENTS (continued)

LIST OF FIGURES

TABLE OF CONTENTS (continued)

LIST OF FIGURES

TABLE OF CONTENTS (continued)

LIST OF PLATES

APPENDICES

SECTION 7 STUDY FOR MODIFIED ROOSEVELT DAM, ARIZONA (THEODORE ROOSEVELT DAM)

HYDROLOGIC EVALUATION OF WATER CONTROL PLANS SALT RIVER PROJECT TO GILA RIVER AT GILLESPIE DAM

I. INTRODUCTION

A. BACKGROUND

The following discussion includes a definition of terminology which will be used throughout this report, and a brief introduction to the history of the Salt River Project as well as the history of the hydrologic analyses for the Salt River performed previously by the Los Angeles District (LAD). The title "Modified Roosevelt Dam" is used throughout this report to refer to Theodore Roosevelt Dam, modified structurally as authorized under PL 95-578, to include an additional allocation of water supply space, a new allocation for flood control, and additional surcharge space, along with new outlets works and spillway configuration. The reservoir formed by Modified Roosevelt Dam is referred to as "Theodore Roosevelt Lake" throughout this report.

1. Study Location. Plates 1 and 2 include a drainage area map of the Gila River Basin which contains the Salt River, and a project location map for Modified Roosevelt Dam. The dam itself is located on the Salt River, approximately 40 miles upstream of the City of Phoenix. The dam controls approximately 5800 sq.mi. of the Salt River watershed, including Tonto Creek which terminates at Theodore Roosevelt Lake. The area impacted by the construction and operation of Modified Roosevelt Dam extends to the Gila River downstream, of which the Salt River is the major tributary. The impacts of the regulation of flood flows from Modified Roosevelt Dam, which reduces peak inflows to Painted Rock Dam, on the Gila River, downstream of the mouth of the Salt River, are moderated by the storage capacity at Painted Rock Dam. However, the modifications to Roosevelt Dam have included the establishment of an additional allocation of water supply space, designated as Additional Active Conservation Capacity (abbreviated AACC). As a result, there will be a reduction in total runoff which reaches Painted Rock Dam.

2. History of Salt River Project.

a. Authorization. The construction of the original Roosevelt Dam was authorized by the Secretary of the Interior in accordance with the Reclamation Act of June 17, 1902 (32 Stat. 338) on March 14, 1903. Originally named "Tonto Dam" and then later "Salt River Dam", (Theodore) Roosevelt Dam was constructed as a part of the Salt River Project which also included the construction of a power plant below the dam, the construction of Granite Reef Diversion Dam located 3 miles downstream of the Salt River and Verde River confluence, and improvement of water distribution canals. The main purpose of the original Roosevelt Dam was to increase and control the region's water supply.

In 1968, the U.S. Congress authorized the United States Bureau of Reclamation (USBR) to construct the Central Arizona Project (CAP) as a part of the Colorado River Basin Act

(PL 90-537). While the primary purpose of the CAP was water conservation, it was also intended to provide extensive flood control protection to the Phoenix metropolitan area and other downstream communities. However, public opposition caused the elimination of some of the proposed features of the CAP (including Orme Dam - please refer to Chapter I. **INTRODUCTION**, Section 3., History of Hydrologic Analyses). As a result of this opposition, the USBR initiated the Central Arizona Water Control Study (CAWCS) as an alternative to the eliminated features of the CAP. The Reclamation Safety of Dams Act (Public Law 95-578), signed on November 2, 1978, authorized the Secretary of the Interior to construct, restore, operate, and maintain new or modified features at existing Federal Reclamation dams to ensure their safety. Based on this decision, the USBR broadened the focus of the CAWCS and included safety of dams as a major objective. The passage of PL 95-578 authorized the USBR to modify (Theodore) Roosevelt Dam.

Modified Roosevelt Dam was designed to provide flood control, hydropower, water conservation, and dam safety, along with other project purposes and benefits consistent with objectives of the CAWCS. Under Section 7 of the Flood Control Act of 1944, the United States Army Corps of Engineers (COE), through the LAD, has the responsibility for developing a water control plan for the flood control regulation of Modified Roosevelt Dam. The history of the original Roosevelt Dam and Modified Roosevelt Dam is summarized on Plate 3. Plate 4 is a comparison diagram of the original dam and the modified dam.

b. The Original Dam. The irrigation of farmlands by settlers in the Salt River Valley began as early as mid-1860's. Diversion dams, canals and laterals were constructed through efforts of both private companies and local communities between 1867 and 1902. As the requirements for more irrigation water grew, engineers and surveyors began to explore the possibilities of building large scale storage structures to increase and control the region's water supply. The Salt River, from Phoenix to the headwaters in the northeastern Arizona mountains, and the Verde River, (the Salt River's major tributary) were surveyed to determine the best location of a major storage structure. One of these investigations concluded that the confluence of Salt River and Tonto Creek appeared to be an ideal damsite for a storage reservoir with a capacity exceeding a million ac-ft of water. In 1903, the Salt River Valley Water Users' Association (later renamed Salt River Project, or SRP), was formed to represent farmers in the Salt River Valley during negotiations with the Reclamation Service (today known as the Bureau of Reclamation - and referred to in this report as the USBR). On March 14, 1903, the Salt River Project was authorized by the Secretary of the Interior. The original SRP system was composed of a storage dam (originally named Tonto Dam or Salt River Dam) located at the confluence of Tonto Creek and the Salt River, a power plant, Granite Reef Diversion Dam, and improved main canals. The storage dam was designed to have a structural height of 280 ft. and a crest length of 723 ft. By 1905, the dam was re-named "Theodore Roosevelt Dam" in honor of President Theodore Roosevelt who signed the federal legislation facilitating its construction.

c. Construction of the Original Dam. The construction of the original dam started in 1903. The primary contractor was J.M. O'Rourke and Company of Galveston, Texas. A series of floodings washed out the temporary coffer dam and other facilities and delayed the construction, hence the dam was not completed by the set deadline of April 1907. The final stone was laid in February 1911, and the construction of the dam was declared complete. The original dam had a structural height of 280 ft. and a crest length of 723 feet. Although originally budgeted at $3 million, the costs tripled to over $10 million by the time the dam was completed.

During construction, the spillways were altered by the addition of 19 tainter gates, that when closed, would provide an additional 15 ft. of reservoir height, increasing the total dam capacity to more than 1,367,300 ac-ft. Three cast iron penstocks, which were not part of the original plan, were added to the north abutment after 1908 to help reduce the need of using the sluicing tunnel under high pressure when the reservoir is filled to capacity.

The dam was formally dedicated in March 1911, and in 1917 the management of Theodore Roosevelt Dam was turned over to the Water Users' Association.

d. Construction of Modified Roosevelt Dam. In August 1989, the USBR awarded a $28.9M contract for the construction of the lake tap and tunnels. This work was completed in November 1991. In February 1991, USBR awarded a $103.63M contract to J.A. Jones Construction Company to raise the dam an additional height of 77 ft, construct new spillways and perform additional construction to the ROW. In May 1991, Neyrpic, Inc. (later changed corporate name to GEC Alsthom Electromechanical Corp.) was awarded the contract to replace the hydraulic turbine in the power house. The completion date of the overall project was estimated to be December 1995. According to the USBR the construction has been completed at the time of publication of this report, except for demobilization. The original and modified dams are compared on Plate 4.

e. Operation of the Salt River Project Reservoir System (SRP).

(1) GENERAL. The SRP system is comprised of six reservoirs on the Salt and Verde Rivers, including Modified Roosevelt Dam, and a diversion dam located 3 miles downstream of the Salt River and Verde River confluence. The other reservoirs on the Salt River are Horse Mesa Dam, Mormon Flat Dam and Stewart Mountain Dam; Horseshoe Dam and Bartlett Dam are located on the Verde River, and Granite Reef Diversion Dam is located below the confluence of the Salt River and the Verde River. The reservoirs receive runoff from a combined watershed of more than 12,600 sq. mi.(excluding Aubrey Basin). Modified Roosevelt Dam is the oldest and has the largest reservoir storage. The SRP reservoir system in central Arizona provides water supply for much of the metropolitan Phoenix area. Hydroelectric power is also generated within the system.

(2) SALT RIVER RESERVOIRS. Normal[1] releases from Modified Roosevelt Dam generate hydropower as they pass through the hydroelectric generating facilities downstream of Modified Roosevelt Dam and the three downstream regulatory dams - Horse Mesa Dam, Mormon Flat Dam, and Stewart Mountain dam. The "normal" releases from Modified Roosevelt Dam and the other Salt River dams are generally scheduled for the warmest months of the year, when runoff is low and demand for both electrical power and water are highest. During the winter months, when runoff is generally greater, downstream demand is typically satisfied by releasing water from the Verde River reservoirs. The storage space in the Verde River reservoirs is considerably smaller than in

---

[1] Normal releases refers specifically to releases made, when the reservoir pool is within the allocated water supply space, to satisfy downstream demand, rather than releases which are necessary, when the reservoir pool is within the allocated flood control space, due to excess inflow, and which must be "wasted" to the Salt River downstream of Granite Reef Diversion Dam.

the Salt River reservoirs[2], which makes carry-over storage on the Verde side impractical. In addition to the considerably greater quantity of storage space available within the Salt River reservoirs, this storage space is more flexible because of pump-back storage capability, which allows hydroelectric power generation during periods of peak demand without "wasting" water. To fully utilize the pump-back storage system, the lake levels in the 3 reservoirs downstream of Modified Roosevelt Dam are typically maintained at about 90% full. The remaining space allows capture and regulation of local inflow.

(3) VERDE RIVER RESERVOIRS. The Verde River reservoirs generally store water during the high runoff season (i.e., the winter months) and release this water at a rate compatible with the demand. As discussed in the previous section, releases from Bartlett Dam are normally made in the winter, when demands are less, because there is insufficient space in the Verde River reservoirs to allow carry-over storage until the warmer summer months, which are accompanied by an increase in demand. During periods when the water available in the Verde River reservoirs is insufficient to meet the downstream demand, surface water from the Salt River reservoirs and/or groundwater may be utilized to meet that demand. During periods of excess inflow, it may be necessary to "waste" water by making releases from the Verde River spillways, which exceed the downstream demand. No hydropower facilities exist at Horseshoe and Bartlett dams.

3. History of Hydrologic Analyses. Flood control for the City of Phoenix, and other locations in Maricopa County affected by flooding from the Salt River, was addressed in a 1957 Interim report on hydrology for the reach from Gillespie Dam on the Gila River to McDowell damsite on the Salt River just below the confluence of the Salt River and Verde River. The reservoir design flood (SPF) used to size the flood pool storage for Modified Roosevelt Dam was developed within that study for the proposed McDowell Dam. The LAD later (circa 1976) investigated flood control at a proposed USBR structure in the same vicinity (Orme Dam, below the Salt-Verde River confluence). While the construction of Orme Dam was authorized, funding was withheld due to environmental opposition. As a consequence, the USBR and the LAD began a "Study of Alternatives for Salt-Gila Flood Control and Regulation of CAP Waters" in 1977. These separate studies were blended together under the name Central Arizona Water Control Study (CAWCS, as stated previously) in 1979, with the LAD conducting the flood control aspects of the study. CAWCS ultimately resulted in a decision by the Secretary of the Interior to proceed with Plan 6 (defined in the following section) in 1984. After funding agreements between local cities and agencies and the USBR had been signed, another environmental challenge was raised concerning the Plan 6 component on the Verde River (Cliff Dam). In the resulting settlement, Cliff Dam was eliminated as a component of Plan 6. In 1993 the USBR and the LAD entered into another agreement in which the LAD would develop the Water Control Manual for regulation of the flood control storage at Modified Roosevelt Dam, under Section 7 of the Flood Control Act of 1944. The development and hydrologic evaluation of the Water Control Plan is presented in this report.

---

[2] The Salt River reservoirs can store approximately 2.5 million ac-ft of water (including approximately 560,000 ac-ft within the flood pool at Modified Roosevelt Dam). In comparison, the Verde River reservoirs can only store approximately 310,000 ac-ft, all of which is water supply space.

4. Plan 6. Formerly the plan selected by the USBR (see par. 3 above, in the History of Hydrologic Analyses), this plan had two flood control components upstream of the confluence of the Salt River and the Verde River - Modified Roosevelt Dam on the Salt River and Cliff Dam on the Verde River. The facilities were sized to replace the Orme Dam (refer to par. 3 again, preceding section), and were operated in a manner that reduced the SPF to 50,000 ft^3/s below the confluence of the Salt and Verde Rivers.

Note: also referred to in this study as "at Granite Reef Dam", since these locations are equivalent from a hydrologic viewpoint.

In addition to the added flood control space (557,000 ac-ft), additional water supply space (Additional Active Conservation Capacity, AACC) and dead storage space, approximately 270,000 ac-ft combined, were added at Modified Roosevelt Dam. Cliff Dam was intended to replace the water supply space currently available at Horseshoe Dam (construction of Cliff Dam would result in stored water which would inundate the upstream Horseshoe Dam) and provide an additional 465,000 ac-ft of flood control storage. Other considerations, such as safety of dams and regulatory storage, will not be discussed herein.

5. Plan 9. Developed subsequent to Plan 6, this alternative was basically identical to Plan 6, but without Cliff Dam on the Verde River. The regulation of the flood control storage at Modified Roosevelt Dam was similar to that in Plan 6. However, without the Verde River flood control component, the objective (controlling the SPF to 50,000 ft^3/s at Granite Reef Dam could not be realized. Hence, the regulation plan for Modified Roosevelt, as a stand-alone flood control facility, was altered to eliminate the downstream target discharge of 50,000 ft^3/s. When sufficient runoff was produced in the watershed upstream of Modified Roosevelt Dam to fill the water supply pool and encroach into the flood control pool, the regulation plan called for a release of outflow equal to inflow or 25,000 ft^3/s, whichever was smaller. The results of this regulation plan were developed at a Reconnaissance level by the LAD in 1983 and modified somewhat in the 1988 Alternatives to Cliff Dam study. Neither of these investigations included the impacts of the AACC, nor did these investigations reflect the impacts of the flood history after 1980 on the hydrologic evaluation of downstream runoff.

6. Constructed Project. Modified Roosevelt Dam, as constructed, is capable of containing a combination of 1,609,000 ac-ft of water supply and sediment, beginning at elevation 1902 and continuing to elevation 2151[3]. The flood control pool is capable of containing 557,000 ac-ft of water (this total differs slightly from the amount designated in the 1982 CAWCS report, and has been utilized for computation purposes in this evaluation) between elevation 2151 and 2175.[4] There is 1,245,300 ac-ft of surcharge space between the top of the flood pool (elevation 2175) and the maximum design water surface elevation at

[3] Based upon 1982 survey data. Consequently, the top of the water supply pool and the top of the flood control pool may migrate to maintain flood control allocation as sediment is accumulated and dispersed within the reservoir.

[4] The top of the flood control pool is located at elevation 2175 ft, NGVD (refer to Plate 8), and is based upon the most recent available survey (included in Appendix C).

2218 ft., NGVD. Plate 4 presents an overview of the modifications to Roosevelt Dam and compares the dam profile as constructed to the pre-existing Roosevelt Dam. An allocation diagram corresponding to the 1982 update of the 1981 sediment survey is included as Plate 8. Appendix C contains a tabulation of the most recent area capacity information. An area capacity curve for Modified Roosevelt Dam is included as Plate 5. Additional information concerning the new outlet capacity for Modified Roosevelt Dam is provided by rating curves for the outlet works (Plate 6) and the gated spillway (Plate 7).

B. PURPOSE

This report will document the development of the Water Control Plan for Modified Roosevelt Dam as well as the anticipated results of implementing the plan. In order to develop the Water Control Plan, the following hydrologic information, based upon streamflow history and simulation of projected SRP System reservoir operation on historical runoff through the 1993 water year, was generated:

- elevation frequency relationships for Theodore Roosevelt Lake
- inflow and outflow frequency relationships for Modified Roosevelt Dam
- inflow and outflow frequency relationships for Verde River reservoirs, i.e. inflow to Horseshoe Dam and outflow from Bartlett Dam
- discharge frequency relationships for locations along the Salt and Gila rivers between Granite Reef Dam and Gillespie Dam.

C. SCOPE

This study has been separated into four major categories:

1. Data Collection/Data Reduction. The study which led to the 1982 CAWCS Hydrology report included data collected for the period of August 1888 through February 1980. Data for that period was developed for inflow to the upstream SRP reservoirs on the Salt and Verde rivers, i.e. Modified Roosevelt Dam and Horseshoe Dam, and included peak flows as well as daily flows. Additional flow data was developed throughout the study area for local inflow downstream of the reservoirs, as well as for runoff in the Gila River downstream of the Salt River confluence. That data, or the results of that data (e.g. local inflow discharge-frequency curves for the reach between the Granite Reef Diversion Dam and the Gila River, along with Gila River simultaneous discharge-frequency values (as applied in the 1982 CAWCS Hydrology report), were used directly in this study. Additional data for the period beginning in February 1980 (the data in the 1982 report for the February 1980 flood was provisional) and extending through September 1993 was collected during this study to augment the original data set. Volume frequency relationships for inflow to Modified Roosevelt Dam and Horseshoe Dam were reevaluated to account for the additional years of data, and the flow duration data was extended from the 10-day duration investigated in the 1982 study to 90-days to provide additional information. Flow duration data beyond 10-day annual maxima was collected and analyzed for the entire period from August 1888 through September 1993 for this study. The extended results are summarized in Table 3, and frequency curves are shown in Figures 6-1 through 6-10 and 7-1 through 7-10.

2. Monthly Simulation of Modified Roosevelt Dam Water Supply Operation - Salt River Project Simulation Model (SRPSIM). In the intervening years between the CAWCS study and the actual construction of Modified Roosevelt Dam, the USBR's monthly reservoir simulation model for evaluation of water supply operation in the SRP system (especially at Modified Roosevelt Dam) had been acquired by SRP. This model, which is essentially a mass balance of reservoir inflow, reservoir releases, reservoir losses, and groundwater pumpage, was modified by SRP to better reflect their operational experience and objectives. Under a contract with the USBR in 1994, SRP performed several Period-of-Record (POR) simulations to screen the 105 years of data into a manageable array. The results of this study - a POR display of the months when SRP would have to waste water to the Salt River past Granite Reef Diversion Dam, the volume of the water wasted, and the reservoir storage - were provided to the LAD. Based upon this information, for months in which the water surface elevation behind Modified Roosevelt Dam reached the flood pool, and for months when excess runoff in the Verde River resulted in wasted water at Granite Reef Diversion Dam, the LAD performed short time-interval flood routings of the SRP system operation for each water control plan using the HEC-5 SIMULATION OF FLOOD CONTROL AND CONSERVATION SYSTEMS model, developed by the Hydrologic Engineering Center (HEC), in Davis, CA. The outflows for these events were routed to the confluence with the Gila River. Local inflow discharge-frequency relationships, developed in the 1982 CAWCS Hydrology study, were combined with the discharge frequency relationships developed for locations of interest along the Salt River from the reservoir simulation. Downstream from the Gila confluence, simultaneous Gila River discharges used in the 1982 CAWCS Hydrology study were used to provide estimated discharge frequency relationships for the reach between the Salt River and Gillespie Dam.

3. Development of Water Control Plans. The original Plan 6 (1982) would have limited the SPF[5] for which the flood control pool at Modified Roosevelt Dam was designed (see Section E. Previous Reports) to 50,000 ft^3/s at the confluence of the Salt and Verde River (or at the Granite Reef Diversion Dam). However, elimination of Cliff Dam on the Verde River as a component of Plan 6 makes this result unachievable. In fact, the SPF at the same location with no release from Modified Roosevelt Dam is 180,000 ft^3/s. On the other hand, in the interim period between completion of CAWCS and the beginning of construction of Modified Roosevelt Dam, the number of bridges with sufficient hydraulic capacity to pass the Plan 9 100-year discharge (175,000 ft^3/s at the Salt-Verde confluence) has been increased, and channel improvements to pass a flow of this magnitude have been made within the Salt River floodplain. Thus, although a target discharge of 50,000 ft^3/s is unrealistic, the improvements to the Salt River have greatly reduced the potential for damage from flows of this magnitude.

Another difficulty in formulating water control plans for the constructed project was the lack of economic verification of the best plan. No economic evaluation of water control plans

[5] The flood control pool allocation for Modified Roosevelt Dam was designed to control the Salt River at Roosevelt Dam component of the SPF for the entire Salt River, i.e. below the confluence with the Verde River, to a maximum release of 25,000 ft^3/s. Combined with coincident downstream runoff and releases from the Verde River reservoirs, which would have also been limited to 25,000 ft^3/s by Cliff Dam, the maximum discharge at Granite Reef Diversion Dam would have been 50,000 ft^3/s.

would be made as a part of this Section 7 Study, as agreed to by both the USBR and the LAD. Moreover, the actual non-damaging (i.e. the point at which some damage ensues) discharge in the Salt River through the metropolitan area is very low, but stage-damage relationships were not developed as a part of this study. As a consequence, the benefit of trade-offs between reducing the discharges for frequent floods versus greater discharges for frequent floods but maintaining a higher level-of-protection during large (or infrequent) flood events, was not evident.

Note: **while the non-damaging discharge in the reach of the Salt River through the City of Phoenix and the other cities which share the floodplain is quite low, construction of the high discharge capacity bridges has increased the flow rate at which significant damages occur.**

Finally, several performance criteria had been established during the CAWCS which had to be met by any proposed water control plan. First, the maximum elevation of the floodpool (2175 ft, NGVD) could not be exceeded during simulation of the reservoir design flood (the SPF). Second, to be consistent with the environmental analysis previously performed, the floodpool had to be evacuated within 20 days during the reservoir design flood. And third, the maximum water surface elevation during simulation of the spillway design flood, i.e. the Probable Maximum Flood (PMF), which in the case of Modified Roosevelt Dam is also the Inflow Design Flood (IDF), could not exceed the USBR's design water surface of 2218 ft, NGVD.

As a consequence, water control plans were formulated which were variations of Plan 9 (namely P925K and P9OP1), or which were logical applications of the available flood space - during small runoff events or during the initial phase of large events, small releases are scheduled; as the event increases in magnitude, leaving a diminishing amount of flood control space, larger releases are scheduled. The magnitude of the scheduled releases is "stepped" up according to the water surface elevation within the flood pool. Variations to account for simultaneous runoff from the area downstream of Modified Roosevelt Dam in a real-time mode were also introduced into the schedules. The stepped water control plans (namely P6OP1 and P6OP2) were formulated based upon the discharge capacity of the SRP facilities, including both the outlets and the spillways as well as the turbines. A comparison of the proposed water control plan regulation schedules for the types of plans characterized as derivatives of plan 9 and plan 6 are shown in Table 4.

The acronyms selected are explained below:

P925K - Based upon the original plan 9 concept, with outflow = inflow, and a maximum flood control release of 25,000 ft^3/s, i.e. 25K.

P9OP1 - A variation of the original plan 9 concept, with outflow = inflow, and a maximum flood control release of 25,000 ft^3/s, combined with a real-time operation (OP1) to attempt to limit the maximum discharge at Granite Reef Diversion Dam to

180,000 ft^3/s.

P6OP1 - The basic "stepped-release" plan adapted to the establishment of flood control space at Modified Roosevelt Dam, without the Cliff Dam component (sometimes referred to as Plan 6 without Cliff Dam, hence P6). The plan is limited to the basic, fixed stepped-release schedule (OP1) shown in Table 4; releases are a function of water surface elevation only.

P6OP2 - A variation of the basic "stepped-release" plan (P6), in which the OP1 schedule (based upon water surface elevation) is followed, along with a real-time accounting of Verde River reservoir releases and local intervening inflow. The resulting operation (referred to as OP2) requires scheduled releases to be reduced in an attempt to limit the maximum discharge at Granite Reef Diversion Dam to 180,000 ft^3/s. To accommodate the potential reduction from the basic scheduled releases, higher releases are scheduled for this plan (OP2) when the reservoir water surface elevation reaches 2172 ft, NGVD, as shown in Table 4.

4. Evaluation of Water Control Plans. Each water control plan was tuned so that implementation of the plan met the three criteria presented in the previous discussion. In addition the resulting discharge frequency and elevation frequency relationships, based upon implementation of each plan, were compared. Finally, the practicability of each plan was evaluated based upon feedback from local agencies as well as the owner (USBR) and the operator (SRP) of Modified Roosevelt Dam.

D. DRAINAGE AREA.

Note: Most drainage area computations referred to within this report are based upon subarea delineations conducted for the 1982 CAWCS Hydrology Report and listed in Table 7 of that document. These delineations represent effective drainage area only, and may be in disagreement with drainage areas from other sources which report total area. The drainage areas listed for locations downstream of the Salt River and Verde River confluence are rounded. The drainage area for the Gila River at the mouth is consistent with data published by the United States Geological Survey (USGS) for the Gila River at Dome, which excludes all closed basins except Aubrey Basin in the Verde River watershed, and is not based upon the effective drainage areas determined as mentioned above.

1. Modified Roosevelt Dam to Granite Reef Diversion Dam. The Salt River originates on the eastern portion of the Mogollon Plateau, in the White Mountains, with peaks as high as 11,590 feet (Baldy Peak). The Salt River is formed by the confluence of two westward flowing streams, the White and Black rivers, and drains the rugged central

section of Arizona, which is marked by isolated mountain ranges with steep-walled canyons and gorges. The Salt River drains directly into Theodore Roosevelt Lake where it is joined by Tonto Creek, which flows southward out of the Tonto Basin at the base of the Mogollon Plateau. The United States Geological Survey (USGS) operates streamgages on both the Salt River (near Roosevelt) and Tonto Creek (above Gun Creek), which measure inflow to Modified Roosevelt Dam from 4,981 sq.mi. of the contributing drainage area. The total contributing drainage area upstream of Modified Roosevelt Dam, including Theodore Roosevelt Lake, is approximately 5800 sq.mi. The total drainage area of the Salt River at the most downstream facility - Stewart Mountain Dam - is approximately 6200 sq.mi. Releases from the Salt River system reservoirs are measured by the USGS at a streamgage located 3.5 mi. downstream of Stewart Mountain Dam. The Salt River is joined by its major tributary, the Verde River, approximately 9.5 mi. below Stewart Mountain Dam.

2. The Verde River to the Salt River Confluence. The Verde River flows south out of the Chino valley, which is bounded on the west by the Juniper and Santa Maria Mountains, and is separated from Tonto Basin on the east by the Mazatzal Mountains. Horseshoe Dam, which has a contributing drainage area of 5657 sq.mi., excluding Aubrey Basin which is closed, is 9 miles downstream from the USGS streamgage located on the Verde River below Tangle Creek, and is the upstream SRP dam on the Verde River. Bartlett Dam is the downstream SRP facility on the Verde River and is approximately 15 miles below Horseshoe Dam and 25 miles upstream from the confluence with the Salt River. The total drainage area at Bartlett Dam is 5851 sq.mi., excluding the 373 sq.mi. Aubrey Basin. Releases from the Verde River system reservoirs are measured by the USGS approximately 2.1 mi. downstream of Bartlett Dam. Sycamore Creek (drainage area = 164 sq.mi.) is the major tributary of the Verde River downstream of Bartlett Dam. The Verde River joins the Salt River approximately 25 miles downstream of Bartlett Dam. The effective drainage area at the mouth (excluding the Aubrey Basin) is approximately 6300 sq.mi.

3. Salt-Verde Confluence to the Gila River. Granite Reef Diversion Dam, located about 3 mi. downstream of the Salt River and Verde River confluence, is the final SRP dam on the Salt River. This dam normally diverts upstream SRP releases from the Salt River into the Arizona Canal to the north of the dam and the South Canal to the south of the dam. During periods of high flows, water passes over the dam and continues down the Salt River. The Salt River ultimately joins the Gila River at mile 198 (measured from the mouth of the Gila River at Yuma, Arizona, and approximately 40 miles downstream of Granite Reef Diversion Dam. The Salt River drains a total area of about 13,000 sq.mi. (excluding Aubrey Basin) to the Gila River, of which nearly 12,600 sq.mi. above the Granite Reef Diversion Dam is regulated.

4. Gila River. The drainage area of the Gila River (see Plate 1) covers approximately 58,000 sq.mi. and extends from the Continental Divide in southwestern New Mexico to the Colorado River at Yuma, Arizona, including practically all the southern half of the State of Arizona. The Gila River, which is 654 miles long, rises in an area of high mountains and plateaus and flows westward in a generally central course through the basin. The Gila River includes the following major tributaries, listed in order of drainage area size:

- the Salt and Verde Rivers, combined drainage area of 13,000 sq.mi.
- the Santa Cruz River, drainage area of 8,600 sq.mi.
- the San Pedro River, drainage area of 4,500 sq.mi.
- the San Francisco River, drainage area of 2,800 sq.mi.
- the San Simon River, drainage area of 2,200 sq.mi.
- the Agua Fria River, drainage area of 2,000 sq.mi.
- the Centennial Wash, drainage area of 1,800 sq.mi.
- the San Carlos River, drainage area of 1,027 sq.mi.
- others, including Queen Creek, the Hassayampa River, and Waterman Wash.

Elevations in the basin range from more than 12,000 feet in the San Francisco Peaks in the Verde River basin, to 130 feet in the vicinity of Yuma. Much of the northern part of the basin is extremely irregular and rugged with elevations ranging from 7,000 feet to 12,000 feet along the basin boundaries. This portion of the basin is mostly drained by the Salt River, which joins the Gila River at mile 198, near Phoenix. The eastern half of the southern part of the basin consists largely of long desert valleys lying between north-south ranges of rugged mountains; here the elevations are generally lower but in places are above 10,000 feet. The southwestern third of the basin consists essentially of broad, flat, low-lying desert valleys and isolated mountains of relatively low relief; comparatively few localities are more than 4,000 feet in elevation, and a large part is below 1,000 feet; the elevation of the river mouth near Yuma is about 130 feet. The major streams are also delineated in Plate 1. The climate of the Gila River Basin is semiarid as a whole, but, depending principally upon elevation, ranges from hot and arid to cool and humid. The average annual precipitation ranges from less than 4 inches in the lower desert to 30 inches or more in the highest mountains. Streamflow characteristics vary considerably throughout the basin. The streams in the southern deserts have very little flow other than immediately after the heavier rains, while the northern and headwater streams are perennial. During major storms, streamflow increases rapidly, and in combination with steep gradients and often-barren slopes, results in major floods. Snowmelt is a contributing factor in most winter floods.
There are numerous dams within the Gila River Basin, but only a few of these will exert an appreciable influence on major floods:

- Modified Roosevelt Dam on the Salt River, with a total active storage (including an added flood pool with 557,000 ac-ft) of 2,100,000 ac-ft.
- Horse Mesa on the Salt River, with a storage of approximately 245,000 ac-ft.
- Mormon Flat on the Salt River, with a storage of approximately 58,000 ac-ft.
- Stewart Mountain on the Salt River, with a storage of approximately 70,000 ac-ft.
- Horseshoe on the Verde River with a storage of approximately 131,000 ac-ft.
- Bartlett on the Verde River with a storage of approximately 178,000 ac-ft.
- Coolidge on the Gila River with an active storage of approximately 900,000 ac-ft.
- New Waddell on the Agua Fria River, recently enlarged, with a total storage of approximately 1,000,000 ac-ft.
- Painted Rock on the Gila River, with a flood control pool of approximately 2,500,000 ac-ft.

The locations of these water impoundment facilities are shown on Plate 1.

E. PREVIOUS REPORTS

The following reports present hydrologic information published by the LAD for the Salt River between Granite Reef Diversion Dam and Gillespie Dam, and utilized in the development of the Recommended Water Control Plan:

1. "Interim Report on Survey for Flood Control, Gila and Salt Rivers, Gillespie Dam to McDowell Dam Site, Arizona (with Appendixes)", United States Army Corps of Engineers, Los Angeles District, December 4, 1957.

2. "Gila River and Tributaries, Central Arizona Water Control Study, Hydrology", US Army Corps of Engineers, Los Angeles District, May 1982.

3. "Hydrologic Analysis of Cliff Dam Alternatives", U.S. Army Corps of Engineers, Los Angeles District, September 1988.

4. "Hydrologic Evaluation of Impacts of New Waddell Dam on Downstream Peak Discharges in the Agua Fria River, Los Angeles District, July 1995.

II. RESULTS

A. SELECTED WATER CONTROL PLAN

The Water Control Plan recommended by the LAD is referred to within this report as *P6OP2*. This plan has a stepped release schedule with a maximum scheduled flood control release of 53,100 ft^3/s. In addition, the scheduled releases are to be made in a real-time operation mode based upon simultaneous releases from the remainder of the SRP system reservoirs, as well as local intervening runoff. The SPF peak flow resulting from implementation of this plan is 193,000 ft^3/s at Granite Reef Diversion Dam, and the 100-year peak discharge at that location is 175,000 ft^3/s. The recommended Water Control Plan Schedule is shown on Plate 11 and the discharge frequency and elevation frequency relationships resulting from implementation of this plan are shown in Table 1. Included in Table 1 are comparisons of the results of four water control plans evaluated in detail during this study.

Note: Deviation from the recommended plan may result in discharge and elevation frequency relationships which are inconsistent with those presented herein, and may also result in water being stored above elevation 2151 for longer periods than approved in the EIS.

B. INFLOW FREQUENCY

The volume frequency relationships developed for the upstream SRP dams, i.e. (Modified) Roosevelt Dam on the Salt River and Horseshoe Dam on the Verde River, for the 1982 CAWCS Hydrology report were updated to include additional years of data post-1980. In addition, inflow volumes for durations beyond 10-days, provided in the 1982 Hydrology report, were developed from systematic streamflow information. The additional duration discharges provided are for 30-, 60-, and 90-days. Inflow volume-frequency curves, including the 30-, 60-, and 90-day durations for both Horseshoe Dam and Modified Roosevelt Dam, are shown on Figures 6-1 through 6-10 and 7-1 through 7-10. These volume frequency relationships are also summarized in Table 3, which includes a comparison to 1982 CAWCS Hydrology results. In general, the peak inflows to the reservoirs have increased somewhat due to inclusion of the additional record and interpretation of the total POR. Plate 9 presents a graphical portrait of Modified Roosevelt Dam inflows used in simulation of the POR from 1889 to 1993. The analysis is discussed in Section A of Chapter III, the Technical Analysis.

C. OUTFLOW/ELEVATION FREQUENCY

Outflow frequency relationships are presented for the upstream and downstream dams on the Salt River above the Verde River confluence, Modified Roosevelt Dam and Stewart Mountain Dam, as well as for the downstream dam on the Verde River, Bartlett Dam, in Tables 1 and 2-1. Elevation frequency relationships are presented in Table 1 also, for Modified Roosevelt Dam only. Both the outflow frequency relationships and elevation frequency relationships are interrelated and are functions of reservoir inflow, carryover storage, system demand, and water control plan. Outflow frequency relationships have been developed for flood releases only and do not represent normal operation within the water supply pool.

Based upon SRPSIM results there are 34 years in the 105-year period in which water is wasted over Granite Reef Diversion Dam ("spill") due to an excess of upstream inflow and storage compared to demand. Of these 34 simulated years when the SRP system "spilled", there are 25 years in which Theodore Roosevelt Lake reached elevation 2151 (the top of the water supply pool); during 24 of these years Modified Roosevelt flood releases passed through Stewart Mountain Dam and "spilled" to the Salt River downstream of Granite Reef Diversion Dam. Figures 3-1 through 3-3 present a graphic display of the "spilling" frequency for Modified Roosevelt Dam, Bartlett Dam, and Granite Reef Diversion Dam. Figures 4-1 through 4-3 present a graphic of annual maximum storage for the Modified Roosevelt Dam on the Salt River, and Horseshoe Dam and Bartlett Dam on the Verde River. Finally, Figure 5 shows a comparison between the annual maximum storage at Modified Roosevelt Dam and the annual maximum discharge at Granite Reef Diversion Dam for the Recommended Water Control Plan.

Elevation frequency relationships for Modified Roosevelt Dam were developed by compositing the annual maximum elevation from SRPSIM for the 81 years when it was at or below the flood pool (elevation 2151) and did not "spill", with the maximum elevation reached during short time interval reservoir routing (HEC-5 results) of the critical runoff events during the 24 years when the water surface elevation at Theodore Roosevelt Lake reached elevation 2151[6] and "spilled". These simulations of observed monthly inflows (for events which did not "spill") and observed short time interval inflows (for events in which a "spill" occurred) were augmented with short time interval simulations of synthetic flood hydrographs. Based upon the analysis performed, implementation of the recommended Water Control Plan for Modified Roosevelt Dam would result in the maximum elevation of Theodore Roosevelt Lake exceeding elevation 2175 (the top of the flood pool) for events with a probability of exceedance of <.004, i.e. <1-time per 250-years, on-the-average. Hence, since as a component of the project to modify Theodore Roosevelt Dam the Federal Government has purchased property below this elevation, damage to property adjacent to the reservoir has about a 0.4 % chance of occurring in any year.

Table 2-1 includes volume frequency relationships[7] for outflow from the Salt River below Stewart Mountain, and the Verde River below Bartlett Dam, developed based upon SRPSIM "spills", for 30-, 60-, and 90-day durations.

---

[6] Based upon SRPSIM results, in April 1937 an insignificant spill would have occurred (6,100 ac-ft). The maximum water surface elevation for such a small "spill" would not have exceeded elevation 2151. Thus, this event was included in the subset of events which did not spill, i.e. the maximum water surface elevation from SRPSIM was used, rather than determined from a short time interval routing.

[7] The 1982 CAWCS Hydrology report included simulated POR duration discharges for CP-40, a control point located below the Salt River and Verde River confluence, and CP-113, a control point at the mouth of the Salt River (just above the Gila River confluence):

- At CP-40 durations included peak, 1-, 2-, 3-, 5-, and 10-day, and 1-month.
- At CP-113 durations included peak, 1-, 2-, 3-, 5-, and 10-day.

D. DISCHARGE FREQUENCY RELATIONSHIPS AT DOWNSTREAM CONTROL POINTS

Additional discharge frequency information for the Recommended Water Control Plan is included in Tables 2-2 and 2-3 which show the downstream discharges at Granite Reef Diversion Dam, upstream and downstream of the confluence with the Gila River, to Gillespie Dam. Table 2-2 also includes volume frequency relationships for the Salt River at Granite Reef Diversion Dam and above the Gila River confluence, developed based upon simulated flood routings and SRPSIM "spills", for the 1-, 2-, 3-, 5-, 10-, 30-, 60-, and 90-day durations. Discharge frequency relationships for the Gila River between the Salt River and Gillespie Dam are summarized in Table 2-3. The discharge frequency relationships for the Gila River were based upon simultaneous discharges in the Gila River developed for the 1982 CAWCS Hydrology report. New Waddell Dam has greatly reduced inflow to the Gila River from the Agua Fria River based on results of a recent study by the LAD conducted for the USBR (see chapter I. Introduction, Section E. Previous Reports). The results of that study, which were accounted for in this report, indicate that the peak flows which reach the Gila River are not only smaller in magnitude, but also occur more typically in the summer, thus they are not usually contemporaneous with flood flows resulting from releases from the upstream reservoirs in the Gila River basin. A summary of peak frequency-discharges, resulting from implementation of the Recommended Water Control Plan, is shown in Table 2-4, for Control Points (CP's) between Granite Reef Dam on the Salt River and Gillespie Dam (now breached) on the Gila River. These CP's were referenced in the 1982 CAWCS Hydrology report[8]. Table 2-4 also includes the Without Project[9] discharges presented in that report[10] for comparison purposes only. No effort has been made within this study framework to update Without Project Conditions from the database used in that study, which began in August 1888 and extended through February 1980, or to adjust the Without Project peak discharges to account for impacts of current channel modifications on attenuation.

Discharge frequency relationships for peak flows are based upon streamflow routing of "spills" over Granite Reef Diversion Dam. Results for intermediate locations between Granite Reef Diversion Dam and Gillespie Dam on the Gila River were interpolated based upon relative distance downstream. For that purpose, Figure 40 presents a discharge frequency profile for the Salt and Gila Rivers in this reach, with the Recommended Water Control Plan.

Implementation of the recommended Water Control Plan will result in the 100-year discharge in the Salt River between Granite Reef Diversion Dam and the Gila River being equal to or less than 175,000 ft^3/s. The hydraulic capacity of the bridges across the Salt

---

[8] Table 23, Discharge Frequency Values, Salt River and Gila River, Existing Conditions.

[9] Without Project used in the context of this report is equivalent to the Existing Conditions in the context of the 1982 CAWCS Hydrology report, i.e. Without Project excludes not only the Recommended Water Control Plan, but also the structural modifications to Roosevelt Dam.

[10] Refer to footnote 8.

River and Gila River, which have been built or improved after the February 1980 flood, is at least 180,000 ft^3/s. Plate 10 presents of graphical depiction of the hydraulic capacity of the Salt River and Gila River crossings. Figure 18 compares the hydraulic capacity of these crossings to the peak flow rates resulting from the reservoir design flood/SPF for each water control plan.

Note: there is some attenuation of the SPF as it moves downstream. Also, downstream of the Salt-Gila River confluence, the SPF increases due to contributions from the Gila and Agua Fria rivers. Thus, comparison of the SPF peak flow rate at the Salt - Verde confluence to downstream bridge discharge capacity may be misleading.

III. TECHNICAL ANALYSIS

A. INFLOW VOLUME FREQUENCY, 1889-1993

In order to develop inflow volume-frequency relationships for Modified Roosevelt Dam, the only requirement would be to collect and analyze the POR inflows to Theodore Roosevelt Lake. Statistical relationships for duration inflows could then be developed using annual maxima. However, to provide sufficient information for developing a water control plan for Modified Roosevelt Dam, inflow frequency to Modified Roosevelt Dam is insufficient. Simulation of the POR inflows can provide a suitable basis for comparison of water control plans. To supplement the POR evaluation of water control plans for Modified Roosevelt Dam, the use of synthetic flood hydrographs is a valuable tool. Synthetic flood hydrographs can be developed from statistical information (Balanced Flood Hydrographs, see Chapter III, Section A.4). These synthetic flood hydrographs can also be routed through the SRP reservoir system to determine downstream peak and duration flows. It is crucial to develop inflow frequency relationships for both Modified Roosevelt Dam on the Salt River stem and Horseshoe Dam on the Verde River stem. In addition it is useful to display the Verde River inflow frequency as well as outflow frequency relationships for both the Salt and Verde rivers and elevation frequency at Theodore Roosevelt Lake. These latter results are outcomes of this study and their inclusion in this report provides further information which, based upon past experience in the LAD, will be needed by a variety of parties after construction of Modified Roosevelt Dam is completed.

Inflow data for the period from August 1888 through February 1980 was developed from United States Geological Survey (USGS) daily flow data for 1-, 2-, 3-, 5-, 10-, 30-, 60-, and 90-day inflow to Modified Roosevelt Dam and Horseshoe Dam. In addition, peak inflows for this period were also developed based upon published streamflow (USGS), historical estimates, and by means of correlation analysis whenever possible when published peak flows were unavailable. In addition calculated reservoir inflow (SRP data) was used for some years when readily available. During this study, the preexisting data base was extended from 1980 through 1993. The complete sets of monthly inflows to the SRP system upstream reservoirs (Modified Roosevelt Dam and Horseshoe Dam) are presented in Appendix A, and the annual maximum inflows (peak and duration) are presented in Appendix B. The monthly inflow sets were used in the SRPSIM historical screening process discussed in Section B of this Chapter. The annual maximum duration inflows to Modified Roosevelt Dam and Horseshoe Dam are discussed in the following sections.

1. Modified Roosevelt Dam. Two sets of inflow data were developed: Station Inflow, and coincident inflow.

a. Station Inflow. The combination of the Salt River and Tonto Creek inflow to Theodore Roosevelt Lake was computed for daily flows and adjusted to account for the intervening drainage area between the pertinent streamgages and Theodore Roosevelt Lake. The amount of adjustment varied during the POR because the gages were not stationary. Based upon the chronology of the location of the gages, the inflows were increased (for periods when the gaged drainage area was less than the area contributing to Theodore Roosevelt Lake) or decreased (for periods when the gaged area was greater than the area contributing to Theodore Roosevelt Lake, i.e. for periods prior to the construction

of Roosevelt Dam, when the gage was downstream of the location of Theodore Roosevelt Lake). A graph showing the location of the streamgages through the POR is shown on Figure 1. Figure 2 provides another look at the chronological location of these streamgages. Adjustments made based upon the drainage area were confirmed using periods when overlapping data was available.
In general the concept used to compute the annual maximum duration inflow to Theodore Roosevelt Lake was to compute the greater of:

- the annual maximum flow for the Salt River for the duration considered and the simultaneous Tonto Creek flow for that same duration, or
- the annual maximum flow for Tonto Creek for the duration considered and the simultaneous Salt River flow for that same duration.

To compute the peak annual inflow to Theodore Roosevelt Lake, a modification of this procedure was used. The peak inflow was determined to be the greater of:

- the annual maximum instantaneous flow for the Salt River and the simultaneous average Tonto Creek flow on that same day, or
- the annual maximum instantaneous flow for Tonto Creek and the simultaneous average flow for the Salt River on that same day.

b. Combined Coincident Component Inflow (CCCI). In addition to Station Inflow, which simply represents the largest inflow to the reservoir in each year, another annual maximum series of duration inflows to the reservoir was developed. This series was necessary for modeling purposes because downstream flow in the Salt River is the product of inflows to both stems of the SRP system. Hence, to determine the flow at Granite Reef Diversion Dam, it is necessary to know the simultaneous runoff from both the Salt and the Verde rivers. To determine these components, series of annual maxima for each duration, representing the component of flow on the stem of interest (in this case the Salt River), were developed in a manner similar to the methods by which annual maximum duration inflow to Theodore Roosevelt Lake was determined:

- the annual maximum inflow to Theodore Roosevelt Lake for each duration was combined (for comparison purposes only) with the coincident inflow to Horseshoe Reservoir, and
- the annual maximum inflow to Horseshoe Reservoir for each duration was combined with the coincident inflow to Theodore Roosevelt Lake.
- The greater of the combined flows for each duration was then flagged as being the Combined Coincident Event, and the duration inflow for that event was entered into the data base of the maximum Combined Coincident Component Inflow, or CCCI.

2. Horseshoe Dam. Two sets of duration inflows to Horseshoe Lake were developed in a manner similar to that employed for Theodore Roosevelt Lake inflow.

a. Station Inflow. Annual maximum inflow to Horseshoe Lake was taken directly from USGS streamflow record for the Verde River below Tangle Creek for the period since 1946 (the gage is about 9 mi. upstream of Horseshoe Dam, drainage area = 5858 sq.mi.), because the intervening drainage area is only about 1% of the total drainage area. Prior to 1946 (approximate time of completion of Horseshoe Dam), unregulated streamflow on the Verde River was measured at several locations downstream of this site. Figures 1 and 2 show the location of Verde River streamflow gages over time. As in the case of streamflow in the Salt River, adjustments to Verde River streamflow made based upon the drainage area were confirmed using periods when overlapping data was available. For periods prior to the construction of Horseshoe Dam, when the location of the gage was downstream of the actual location of Horsehoe Dam, the published streamflows were decreased, since the gaged area was greater than the actual contributing area of Horseshoe Lake.

b. Combined Coincident Component Inflow (CCCI). As previously described for CCCI to Theodore Roosevelt Lake, another annual maximum series of duration inflows to the reservoir was developed, because it is necessary to know the simultaneous runoff from both the Salt and the Verde rivers. To determine these components, series of annual maxima for each duration, representing the component of flow on the stem of interest (in this case the Verde River), were developed:

- the annual maximum inflow to Horseshoe Reservoir for each duration was combined (for comparison purposes only) with the coincident inflow to Theodore Roosevelt Lake, and
- the annual maximum inflow to Theodore Roosevelt Lake for each duration was combined with the coincident inflow to Horseshoe Reservoir .
- The greater of the combined flows for each duration was then flagged as being the Combined Coincident Event, and the duration inflow for that event was entered into the data base of the maximum Combined Coincident Component Inflow, or CCCI.

3. Statistical Analysis. Data sets for the annual maximum series developed for inflows to Theodore Roosevelt Lake and Horseshoe Lake were then ranked, ordered and plotted using median plotting positions on log-frequency probability paper. Water Resources Council Bulletin 17B Guidelines were then employed, assuming the data was represented by the log-Pearson Type III Distribution. Application and modification of those results is discussed in the following sections.

a. Station Inflow. Station Inflow statistics were generated for inflow to the SRP system -(Theodore Roosevelt Lake and Horseshoe Lake) for each duration. Frequency curves generated from the statistics were superimposed on the plotted flow data for each duration. The duration frequency curves were smoothed to portray a "family" of consistent relationships utilizing the REGIONAL FREQUENCY COMPUTATION program, developed by HEC. Generally speaking, the discharge frequency curves developed from the statistics do not fit the data well.

b. Combined Coincident Component Inflow (CCCI). The same approach briefly referred to in the preceding paragraph was followed to develop a "family" of smoothed duration frequency curves (or volume frequency curves) for inflow to the SRP system. These volume frequency curves were compared to the observed data as well as to the Station Inflow volume frequency curves. For some durations, including peak or instantaneous flow, the CCCI frequency discharge was greater than the Station Inflow discharge. Intuitively, the CCCI must always be ≤ the Station Inflow; i.e., since the annual maximum inflow event is, by definition, the largest event during each year, the CCCI can, at a maximum, only equal that event. And because the CCCI sample is composed of flows which are always ≤ the Station Inflow in each year, it is an anomaly for projected discharge frequency results from the CCCI sample to exceed those for the Station Inflow sample. Statistical interpretation which conflicts with this conclusion is thus flawed from a physical perspective. At this point in the study a corollary conclusion was reached based on comparison of the data samples for CCCI and Station Inflow: only one set of volume frequency curves would be determined and presented for inflow to the SRP system - the CCCI. This decision was made because the annual maxima for both types of sample were composed of nearly the identical events. While some of the smaller flood events in the CCCI samples vary from the Station Inflow samples, the largest events are consistent. Therefore, from a physical perspective, the discharge frequency relationships for each sample should be identical for less frequent events; and, since the objectives of conducting this study are:

(1) to develop a water control plan for flood regulation, and
(2) to determine the discharge frequency relationships for locations of interest along the Salt and Verde rivers,

the focus is on larger events and/or coincident events, which result in flood releases. Since the CCCI samples do not necessarily fit the log-Pearson Type III Distribution requirements for statistical analysis, graphical interpretation of these annual maxima is appropriate. Graphical interpretation is also appropriate because statistical discharge frequency curves do not fit the data well. Finally, paleontological investigations of sediment deposition have resulted in estimates of peak flows for extended time periods in the vicinity of Theodore Roosevelt Lake and Horseshoe Lake (periods ranging from the past 250 years to nearly 1000 years) which are considerably less than estimates for remote flood events using statistical procedures with the sample sets alone. Inclusion of these estimates in the analysis would result in a more negative skew, corresponding more closely to the frequency curves for peak flows. These "final" discharge frequency relationships for inflow to the SRP are a hybrid of the peak through 10-day volume frequency curves presented for Station Inflow in the 1982 CAWCS Hydrology Report (modified slightly to improve the fit to the sample of observed flows), and 30-, 60-, and 90-day volume frequency curves smoothed using regression and correlation techniques with the REGIONAL FREQUENCY COMPUTATION program. The volume frequency curves for inflow to Horseshoe Dam and Modified Roosevelt Dam are presented on Figures 6-1 through 6-10 and 7-1 through 7-10, and frequency discharges are summarized in Table 3.

4. Balanced Hydrographs. A Balanced Hydrograph (BHF) is a synthetic

hydrograph in which the frequency of exceedance is the same for all durations. The BHF is constructed by compiling a series of duration discharges for a selected discrete frequency, e.g. the 100-year event. For use in this study, the BHFs developed represent both Station Inflow and CCCI, as previously discussed (see Statistical Analysis, above), and can be used to aid in determining maximum outflow- and elevation-frequency relationships for Modified Roosevelt Dam and maximum outflow frequency relationships for Stewart Mountain Dam and Bartlett Dam. To provide additional information, the BHFs were developed with a flow duration of 90-days. These BHFs were patterned after the 1993 flood (refer to Figure 8) which was the largest long-duration event (30-days or more) within the available record. A "pattern" is required to develop the BHF because without this initial condition, there are too many degrees of freedom for a single solution. A computer program, BALANCED HYDROGRAPHS, which was developed by HEC , was used to generate discrete n-year BHFs based on the volume frequency relationships for inflow to the SRP system. Use of these BHFs is discussed in detail in Section D, OUTFLOW/ELEVATION FREQUENCY RELATIONSHIPS, later in this Chapter. The objective of developing BHFs is to provide additional record-based information, beyond that available from routing the POR, from which to estimate the consequences (i.e., maximum water surface elevation, maximum discharge, etc.) of infrequent runoff events. Throughout the water control study, BHFs were utilized for that express purpose - to provide information about rare events from which inferences concerning their magnitude could be reliably made. For more frequent events which were well defined by the POR, inconsistencies between POR and BHF results were resolved by emphasizing the POR results. The BHF's developed for coincident inflow to Horseshoe Dam and Modified Roosevelt Dam are shown in Figures 9-1 through 9-8 and 10-1 through 10-8, respectively.

B. SALT RIVER PROJECT SIMULATION MODEL (SRPSIM)

1. General. To evaluate the impacts of various water control plans on flood flows in the Salt River through the City of Phoenix, and to provide a basis for selection of the "best" plan, the most reliable tool is observed runoff. At the initiation of this study, streamflow record for some locations within the Salt River basin was available, or could be generated from available data, for approximately 105 years (August 1888 through September 1993). However, because of construction of the SRP system, and channel improvements in the Salt River between Granite Reef Diversion Dam and the Gila River, the existing data is non-homogeneous and/or non-stationary. As a means of normalizing streamflow data, simulation under project conditions, i.e. with Modified Roosevelt Dam and the other SRP dams in-place, and including the current channel configuration of the Salt River below Granite Reef Diversion Dam, is the most effective method whenever possible. To determine the merit of various water control plans a two-stage process was employed.

a. Monthly Simulation. To determine the "spilling frequency", the resulting quantities of water "spilled", and the periods of time when these "spills" would have occurred, the SRP system operation for the POR was simulated using a time step of one month. To perform that simulation, the SRPSIM model[11] was utilized because it was inherently a water supply model, maintained by the operators of the system, and capable of being modified to represent the operation of Modified Roosevelt, to include the AACC, along with the 1995 system demand, hydropower generation, and groundwater withdrawal. The alternative, either construction of a new system model or resurrection of the model developed by the LAD for the 1982 CAWCS Hydrology study (which would have required extensive modification), would have been extremely time-consuming and would have to rely on second-hand, proprietary information provided by SRP and the USBR. Consequently, the USBR funded SRP to modify their version of SRPSIM to provide a chronological list of the monthly reservoir operation results including:

- end-of-month storage for Modified Roosevelt Dam, the Lower Salt River Reservoirs, Horseshoe Reservoir and Bartlett Reservoir
- monthly "spills" for Modified Roosevelt Dam, the Lower Salt River Reservoirs, Horseshoe Reservoir, Bartlett Reservoir and Granite Reef Diversion Dam.

The results of the SRPSIM study were provided to the LAD and fully utilized to develop elevation- and discharge-frequency relationships for Modified Roosevelt Dam and discharge frequency relationships for Stewart Mountain Dam, Bartlett Dam, Granite Reef Diversion Dam and locations downstream of the SRP system. More detailed discussion is provided in Sections 3 and 4 of "B. SALT RIVER PROJECT SIMULATION MODEL (SRPSIM)" of this chapter.

b. Simulation of "Spills". Based upon these SRPSIM results, short time-interval routings (Δt=6hrs) for months in which "spills" occurred were performed by LAD using the HEC-5 model for various water control plans. The starting storage for the SRP system reservoirs was taken from the SRPSIM information provided in the monthly screening of system "spills". This process is discussed more fully in Sections 3 and 4 of "D. OUTFLOW/ELEVATION FREQUENCY RELATIONSHIPS" of this chapter.

2. Definition. SRPSIM is a computer program originally written by the USBR in 1979 and updated by them in 1982 for the purpose of providing input to the Central Arizona Project Simulation Model. SRPSIM was modified by SRP in 1985 to provide more flexibility for changing reservoir characteristics.

SRPSIM is a monthly reservoir operation simulation model which is intended for long-range planning. It operates on a water budget basis based upon system inflow, demand, and system losses. Surface water and groundwater requirements to satisfy the demand are determined based upon system storage and available surface runoff. The reservoirs are then operated according to fixed criteria in order to supply the scheduled demand. APPENDIX D contains SRPSIM model background - to include a general description, input/output

[11] The selection of SRPSIM as the fundamental monthly simulation model to serve as the initial screening tool in order to determine the periods during which water would be "wasted" over Granite Reef Diversion Dam is discussed here. A description of the SRPSIM model is contained within this section (B. SALT RIVER PROJECT SIMULATION MODEL (SRPSIM), 2. Definition). The order of the discussion was predicated on the concept that the selection of the model and its use preceded the description of the model. There were other models to choose from, and only the selected model is described.

requirements, and a flowchart.

3. "Spilling Frequency". The POR monthly screening conducted using SRPSIM provided the months during which SRP reservoirs "spilled" under simulated 1995 demands, and the volumes of those "spills". Based upon these results, the water surface elevation behind Modified Roosevelt Dam reached the top of the water supply pool during 25[12] of the 105 simulated years (approximately 23.8 % chance per year). Likewise, Granite Reef Diversion Dam experienced "spills" during 34 of the 105 simulated years (approximately 32.4% chance per year). The additional years with "spills" at Granite Reef Diversion Dam are due to "spills" from the Verde River dams. Verde River "spills" coincide with Salt River "spills", i.e. when the Salt River dams "spilled" so did the Verde River dams; however, there were 11[13] additional years when the Salt River dams did not "spill", but the Verde River dams did. A graphical summary of the monthly "spills" during the simulation period and the maximum "spill" during those months for Modified Roosevelt Dam, Bartlett Dam, and Granite Reef Diversion Dam is shown on Figures 3-1 to 3-3. A chronology of the simulated annual maximum storage behind Modified Roosevelt Dam, Horseshoe Dam, and Bartlett Dam is shown on Figures 4-1 through 4-3. Appendix E contains a summary of monthly reservoir simulations performed by SRP and provided to LAD under contract with the USBR for purposes of this study. This table summarizes pertinent SRPSIM output:

a. SRP end of month (EOM) storages for Modified Roosevelt Dam, Lower Salt dams, Horseshoe Dam and Bartlett Dam for each month during the simulation years, and

b. the "spills" for each month during the simulation years at Modified Roosevelt Dam, Lower Salt dams, Horseshoe Dam, and Bartlett Dam.

4. Elevation Frequency Because this study was conducted to select a water control plan for Modified Roosevelt Dam, and, since no change in operational plans and environmental consequences is anticipated at the remaining SRP reservoirs as a result of this study, development of elevation frequency relationships for other SRP reservoirs was unnecessary.

a. Modified Roosevelt Dam. SRPSIM results included EOM storage contents (see preceding discussion), but did not include elevations. To develop an annual maximum series of elevations at Theodore Roosevelt Lake, the annual maximum storages from SRPSIM results were converted to annual maximum elevations by the LAD. The elevation storage relationship for 1981 and the projected sediment accumulation over time to the year 2040 were determined. The elevation storage relationship for the year 1995 was then interpolated between these elevation storage bounds.

Based upon the resulting annual maximum elevations, an elevation frequency relationship was determined between elevations 1955 and 2151 for the 1995 demand using interpolated sediment accumulation for the year 1995, as shown on Figure 13. The resulting annual

---

12 During 24 of these years SRPSIM results indicated a "spill" from Modified Roosevelt Dam. In 1992 the simulated water surface elevation reached 2151 without a "spill" occurring.

13 The 11 years do not include Water Year 1937 in which simulated "spills" occurred from Modified Roosevelt Dam and the Verde reservoirs, since (per footnote 6) the "spill" from Modified Roosevelt Dam was insignificant.

maximum elevations are shown on Table 12, along with their ranking and relative plotting position (median plotting position) for all events which did not "spill".

Note: the relative severity of any event which reached elevation 2151 (the top of the water supply pool) was not determined by this procedure since SRPSIM is a monthly simulation model. Therefore, the years in which the annual maximum elevation reached 2151 are listed in Table 12, but no plotting position is attached. The maximum elevation and relative plotting position for each of these years were determined using short time-interval routings ($\Delta t=6$ hours), and are discussed in part "D. OUTFLOW/ELEVATION FREQUENCY RELATIONSHIPS" in this chapter.

C. WATER CONTROL PLAN FORMULATION

Water control plans for regulating the flood control pool (elevation 2151 to 2175) at Modified Roosevelt Dam were formulated within guidelines of generalized objectives, as well as specific constraints. Each plan was then tested to determine if the design criteria (see Section 5, Design Flood Evaluation, under this topic) were met; the plans were adjusted to conform to these criteria as necessary. Scheduled releases for each of the water control plans are presented in Table 4.

Note: the water control plans presented within this report, especially the Recommended Plan, conform with the various release mechanisms provided by the Bureau of Reclamation designers for Modified Roosevelt Dam. Accordingly, steps include a hydroelectric turbine capacity of 2200 ft^3/s, a River Outlet Works capacity of 12,200 ft^3/s, and a limitation of 41,000 ft^3/s on the right spillway when making releases without the use of the left spillway. However, there may be some revision to these release capabilities. For example, the turbine capacity varies with head and had not yet been established, and long-duration releases exceeding 25,000 ft^3/s should not be made from the right spillway alone. It has never been the position of the Los Angeles District to instruct the operators of Modified Roosevelt Dam on the means of making flood releases, but rather our objective has been to establish the release steps in a sequence which is compatible with the outlets as well as with beneficial aspects of the operation (e.g. hydropower production),

As a consequence, the water control plan schedules presented within this report (Table 4) include releases for ranges of water surface elevations, but do not specify the facilities by which these releases must be made. Furthermore, in the discussion in Chapter III, Section C, concerning the formulation of the water control plans, general recommendations are made for the purpose of example only, to present a means by which the scheduled releases might be made. Based upon further testing of the turbines and the River Outlet Works, along with ad hoc conditions, the operators of Modified Roosevelt Dam will select the best means of making the scheduled releases during periods when the lake level is ≥ elevation 2151, the top of the water supply pool.

1. Objectives.

a. To minimize downstream damage: however, since no economic analysis will accompany the plan evaluations, this objective can only be qualitatively considered.

b. To minimize flood releases during small events, yet maintain a high level of flood protection.

c. To minimize flood releases during events in which high outflows from the Verde River and/or the downstream intervening area are occurring.

d. To "waste" as little water as possible while making flood releases: limit flood releases to rates at which turbines below Modified Roosevelt Dam, Horse Mesa Dam, Mormon Flat Dam, and Stewart Mountain Dam can still be utilized when encroachment into the flood control pool is not severe.

2. Constraints. Constraints, herein, are factors which limit or affect the flood control release capability. Design constraints are discussed in Section 5. Design Flood Evaluation, of "C. WATER CONTROL PLAN FORMULATION", in this chapter.

a. In general, the downstream bridge capacity is ≥ 180,000 ft^3/s (refer to Table 7 for a summary of downstream channel capacity and to Figure 18 and Plate 10 for a graphical representation of bridge discharge capacity. There are several bridges (at Gilbert Road and 35th Avenue) with considerably less capacity, and there are dip crossings (in-grade) with much smaller capacities, which are not reasonable operational targets because they would flood from necessary releases and/or "spills" from the Verde River reservoirs (approximately 1 year out of 3, i.e. 34 "spills" in 105 years of simulation, see previous discussions).

b. The Verde River reservoirs have no dedicated flood control space, consequently the minimum discharge during the reservoir design flood, the SPF, is 180,000 ft^3/s and the minimum discharge during the 100-year flood is approximately 160,000 ft^3/s. (Figure 14.2 presents the peak discharge frequency curve for Bartlett Dam.) These flow rates would be the result of releases from Bartlett Dam and runoff from the area downstream of Modified Roosevelt Dam and Bartlett Dam, with NO release from Modified Roosevelt Dam.

c. The capacity of the Salt River System hydropower turbines varies from 1900 ft^3/s at Stewart Mountain Dam, to 2200 ft^3/s at Modified Roosevelt Dam, to 6500 ft^3/s at Horse Mesa and Mormon Flat dams. Therefore, any release from Modified Roosevelt Dam which exceeds 1900 ft^3/s results in marginally "wasting" water.[14]

d. Releases from Modified Roosevelt Dam which exceed the capacity of the River Outlet Works (ROW), estimated to be 12,200 ft^3/s, must initially be made from the north (or right) spillway.

e. Releases from Modified Roosevelt Dam which exceed 39,500 ft^3/s (33,000 ft^3/s will pass through the Horse Mesa tunnel gate, and the remainder, an additional 6500 ft^3/s, can be passed with all four generating units on line), may result in generator shutdowns due to 115 KV insulator flashover.

f. Releases exceeding 53,100 ft^3/s from Modified Roosevelt Dam (41,000 ft^3/s from the right spillway, 10,000 ft^3/s from the ROW, and 2100 ft^3/s from the

[14] Constraints listed in this item, "c", through item "j" are taken from SRP correspondence, and were used to formulate the water control plans.

turbine) may require use of left spillway, resulting in 115 KV insulator flashover.[15]

g. Releases exceeding 60,000 ft^3/s will begin to jeopardize the Horse Mesa lower access road pile wall investment (approximately $2.5 million in 1991).

h. Releases exceeding 70,000 ft^3/s will result in ungating the north spillway at Horse Mesa (37,000 ft^3/s) and the tunnel gate (33,000 ft^3/s) at Horse Mesa, resulting in generating unit shutdowns and jeopardizing the roof of the Horse Mesa powerhouse #2.

i. Releases exceeding 85,000 ft^3/s will result in loss of 400 linear feet of the Horse Mesa lower access road. All Horse Mesa generators would likely be shut down. Significant structural damage to power plants and loss of all hydroelectric generation capability increases dramatically.

j. Releases exceeding 110,000 ft^3/s would result in the downstream water surface elevation behind Horse Mesa Dam encroaching more than 1 foot onto the 5-foot high parapet wall.

k. Releases, in combination with local downstream runoff, cannot exceed 150,000 ft^3/s, the discharge capacity of the spillways for the lower Salt River dams.

3. Plan 9. This category of water control plan is based upon the regulation plan originally associated with Modified Roosevelt Dam without Cliff Dam, and referred to as Plan 9 during CAWCS (please refer to Chapter I, "**INTRODUCTION**" for a discussion of Plan 9 and Plan 6). That water control plan essentially called for:

- flood control releases equal to inflow, for inflows $\leq$ 25,000 ft^3/s, and
- flood control releases = 25,000 ft^3/s for inflows > 25,000 ft^3/s.

Two variations of this plan were evaluated, *P925K* which rigidly specified the releases described above and is solely a function of inflow, and *P9OP1*, which called for the same releases, but attempted to minimize the SPF peak discharge at Granite Reef Dam (target = 180,000 ft^3/s). The target was achieved through real-time operation, relying on accurate collection and interpretation of downstream runoff data as well as releases from Bartlett Dam, and minimal reaction time to implement decisions on limiting releases from Modified Roosevelt Dam.

4. Plan 6. This category of water control plan was designed to conform to the objectives and constraints listed in the preceding Sections 1 and 2 of "C. WATER CONTROL PLAN FORMULATION". Of special interest were the concepts of minimal flood control release during small events or during the early stages of a flood event, and compliance with the constraints listed. An attempt was made to provide a schedule of flood control releases which was more flexible (provided a greater range) and which reacted to the severity of the inflow event. Again, two variations were developed, *P6OP1*, a stepped increase plan which rigidly increases outflow as flood space diminishes and is based entirely on water surface elevation, and *P6OP2*, a stepped increase plan which follows the identical

[15] Due to the increasing severity of potential problems ascribed to releases exceeding 53,100 ft^3/s, releases exceeding this amount were not considered as viable options for initial formulation of water control plans. If the water surface elevation at Roosevelt Lake exceeds 2175, the top of the flood pool, releases exceeding this amount will be initiated to maintain the safety of the structure.

initial schedule, but which attempts to minimize the SPF, and offsets the increased storage resulting from real-time operation by increasing the scheduled release for elevations ≥ 2172.

5. Design Flood Evaluation.

a. Reservoir Design Flood: Standard Project Flood (SPF) - Top of Flood Pool, Elevation 2175 ft. NGVD. The flood control allocation for Modified Roosevelt Dam was established by determining the maximum water surface elevation resulting from routing the SPF (generated for the Salt River below the Verde River confluence) through the SRP system of reservoirs, as presented in the 1982 CAWCS Hydrology Report. The maximum flood pool allocation for Modified Roosevelt Dam was determined for Plan 6 (please refer to Chapter I. **INTRODUCTION**, A. BACKGROUND, 4. Plan 6 of this report) which included a flood control component on the Verde River, and limited the peak discharge at the confluence of the Salt and Verde Rivers to 50,000 ft^3/s. Based upon the resulting allocation, the Federal Government acquired land behind Modified Roosevelt Dam up to elevation 2175, the top of the flood control pool, plus 300 linear feet (horizontal). Because of this limited acquisition, the water control plan for the authorized project cannot result in a water surface elevation which exceeds 2175 during the SPF routing. Hence, all water control plans were "tuned" such that this criterion was met. As discussed in the 1982 report, the initial water surface elevation for routing of the SPF was established as the top of the water supply pool, elevation 2151. Based upon SRPSIM results (see Section 3, "Spilling Frequency" of "B. SALT RIVER PROJECT SIMULATION MODEL.." in this chapter), the probability of the water surface being at this elevation or higher is approximately 23.8 % for any year. The discussion of the selection of the Recommended Water Control Plan in this chapter (Section E) contains a tabulation of the maximum SPF water surface elevation based upon HEC-5 simulations for each water control plan.

b. Evacuation Time. The environmental analysis completed for the authorized project was based upon an evacuation of the flood control pool within a 20-day period during the SPF. As a consequence, each water control plan was tested to ensure that the flood control pool was emptied (drawn down to elevation 2151) within 20-days during simulation of the SPF. To comply with this criterion, the release schedules for plans *P6OP1* and *P6OP2* were modified during falling stages so that higher releases were maintained as the reservoir was evacuated. These modifications are included in Table 4. The simulations of the SPF routing at Modified Roosevelt Dam are presented on Figures 16-1 through 16-4, and the resulting flows at Granite Reef Dam are presented on Figures 17-1 through 17-4.

c. Spillway Design Flood: Inflow Design Flood (IDF)[16] *- Maximum Allowable Water Surface Elevation, 2218 ft. NGVD.* The final design criterion evaluated was routing of the spillway design flood (IDF). The IDF was developed by the USBR, and in the case of Modified Roosevelt Dam, is equivalent to the Probable Maximum Flood (PMF) per USBR Technical Memorandum No. TR-222-1. The IDF was used to size the spillway and embankment for Modified Roosevelt Dam. Because the initial design water surface elevation for the IDF was 2151[17] (the bottom of the flood control pool), the maximum

---

[16] The USBR and the Corps of Engineers refer to their spillway design flood as the Inflow Design Flood or IDF.

[17] This elevation is based on USBR hydrologic design criteria used to design Modified Roosevelt Dam.

water surface elevation resulting from routing of the IDF was affected by the water control plans. Hence, the IDF was routed through Modified Roosevelt Dam for each water control plan to determine the ensuing maximum water surface elevation. Since two of the plans, *P9OP1* and *P6OP2*, are real-time operational plans with a maximum downstream target (180,000 ft^3/s), proper evaluation required a coincident flood on the Verde River and downstream tributaries. Hence, the simulation between elevations 2151 and 2175 for these two real-time plans was done based upon not exceeding the downstream target discharge, and with a contemporaneous flood equal to the SPF component on the Verde River. Releases were scheduled to ensure that another constraint, the limiting discharge capacity of the downstream spillways (150,000 ft^3/s at Horse Mesa Dam and Mormon Flat Dam) was not exceeded. Contemporaneous IDF inflow to the three downstream Salt River reservoirs was included in the flood routing, and the maximum release plus local inflow to Horse Mesa Dam and Mormon Flat Dam was limited to 150,000 ft^3/s. IDF routings at Modified Roosevelt Dam for each water control plan are displayed on Figures 19-1 through 19-4, and at Horse Mesa Dam, Mormon Flat Dam, and Stewart Mountain Dam on Figures 20-1 through 20-3 for the Recommended Water Control Plan. The maximum water surface elevation for each of the flood routings is included in the tabulation in Section E of this chapter under part 2, Selection.

D. OUTFLOW/ELEVATION FREQUENCY RELATIONSHIPS

In order to provide sufficient information for agencies and interested parties whose responsibilities include (e.g.) management of the floodplain and road/bridge construction, and to provide sufficient information for more complete understanding of the impacts and limitations of flood control at Modified Roosevelt Dam, outflow frequency relationships developed within this study framework are included for the downstream SRP reservoirs - Stewart Mountain Dam and Bartlett Dam. The outflow frequency relationship for Bartlett Dam in this study is INDEPENDENT of the water control plan for Modified Roosevelt Dam, while the outflow frequency relationship for Stewart Mountain Dam is directly DEPENDENT on the water control plan. Thus, only one set of outflow frequency relationships for the downstream dams will be presented: the singular relationship for Bartlett Dam and the relationship for Stewart Mountain Dam which reflects the Recommended Plan.

Outflow frequency relationships and elevation frequency relationships for Modified Roosevelt Dam are intertwined. Figure 21 is a schematic presentation of the analytical process used to determine elevation/outflow frequency relationships for Modified Roosevelt Dam. Although elevation frequency relationships for the entire spectrum of probabilities will be presented, outflow frequency for Modified Roosevelt Dam (hence for Stewart Mountain Dam also) will only be presented for flood releases, i.e. for elevations ≥ 2151. Therefore, the probability at which flood control releases begin is equivalent to the probability of Theodore Roosevelt Lake ≥ elevation 2151, or 23.8% per year (probability = .238) as previously discussed in Section 3, "spilling frequency" within part "B. SALT RIVER PROJECT SIMULATION MODEL (SRPSIM)" in this chapter.

Elevation frequency relationships for Modified Roosevelt Dam are important for many reasons including determination of frequency of "spilling" (i.e., exceeding the top of the flood control pool) and frequency of inundation of property above elevation 2175. In addition this information provides a baseline for evaluation of environmental aspects of flood control regulation. No elevation frequency relationships were required for the remainder of the SRP dams and are not addressed in this study.

1. Period-of-Record Analysis (POR). The POR analysis referred to in this section INCLUDES the results of SRPSIM presented previously in this chapter. In addition the POR examined draws upon the SRPSIM screen of the simulated monthly operation of the entire project during the years 1889 to 1993 to determine in which months and years water would be "spilled" or wasted over Granite Reef Dam. Based upon that screen, "spills" during 34 years of those 105 years were evaluated. During 34 of those "spill" years water released from Bartlett Dam was wasted (see Figure 4-3 for a chronology of maximum water supply space filled each year at Bartlett Reservoir). Within those 34 years, there were 23 coincident years when water released from Stewart Mountain Dam (based upon Modified Roosevelt Dam releases) also was wasted (Figure 4-1 shows a chronology of the maximum water supply space filled each year at Theodore Roosevelt Lake). For each of these "spill" years the HEC-5 Simulation of Flood Control and Conservation Systems model was utilized by the LAD to evaluate the maximum outflow from the SRP dams and the resulting discharge at Granite Reef Dam.[18] The initial storage for each of these simulated "spills" was taken from SRPSIM (EOM storage). The EOM storage for the month preceding the "spill" was inserted into the HEC-5 model for each SRP reservoir. Table 12 lists the years with "spills" within the simulated POR. Starting storage for SRP reservoirs used in POR simulations are listed in Appendix E, the SRPSIM summary results.

a. Outflow Frequency.

(1) MODIFIED ROOSEVELT DAM. The largest events during the 23 POR "spills", i.e. the month during each of those 23 years which produced the largest outflow, were simulated using HEC-5 to determine the maximum outflow/elevation for each water control plan, as described previously. These maximum values were derived by incorporating the coincident inflow to Horseshoe Dam and Modified Roosevelt Dam along with local tributary inflow downstream of these dams, estimated from overlapping periods of streamflow record (see Figures 1 and 2), and approximately equal to the ratio of the intervening area to the total basin area, 8 %[19]. When local inflow was known, based upon computations made for the 1982 CAWCS Hydrology report, it was input directly. The results were NOT SENSITIVE to local inflow hydrographs. The maximum outflows were then ranked from 1 to 23 and ordered and assigned median plotting positions based upon a 105-year length of record. These discharges were then plotted on log-discharge probability paper, and regulated discharge frequency curves were constructed which corresponded to the scheduled releases and were coordinated with the elevation frequency relationships (See Figures 11 and 12 which present these relationships for the Recommended Plan. The

---

18 The flood hydrographs for each of these POR events were routed from Granite Reef Dam to the Gila River confluence for the Recommended Plan only. This channel routing is discussed later in part F of this chapter.

19 The total drainage area of the Salt River at Granite Reef Dam is approximately 12,600 sq.mi., while the intervening area downstream of Horseshoe and Modified Roosevelt dams is more than 1000 sq.mi. Therefore, the ratio of the intervening tributary area to the area upstream of these dams is approximately 8%.

discussion of elevation frequency relationships is included in a subsequent Section, *b. Elevation Frequency - Modified Roosevelt Dam*). A tabulation of the POR outflows for each water control plan is included in Tables 5-1 through 5-4. Figures 24-1 through 24-7 present a graphical portrayal of flood routing for the five largest simulated historical "spills" for plan P6OP2.

(2) STEWART MOUNTAIN DAM. In general, during flood events, water that is released from Modified Roosevelt Dam, along with tributary inflow, is passed directly through Stewart Mountain Dam. These releases can be anticipatory of the actual arrival of flow from the upstream dams, hence there may be no lag. In the same manner as described in the preceding, the maximum Stewart Mountain outflows for each plan were computed for the 23 "spill" years, then ranked, ordered, and plotted on log-discharge probability paper, using median plotting positions computed for a 105-year period. Tables 5-1 through 5-4 present a summary of these POR outflows. The simulated maximum inflow and outflow for Stewart Mountain Dam are nearly identical for large flood events due to the limited amount of storage.

(3) BARTLETT DAM. Discharges from Bartlett Dam were determined using the HEC-5 model, and are a function of Horseshoe Dam releases/spills routed to Bartlett Dam, local tributary inflow, and outflow-elevation-storage characteristics of Bartlett Dam. The maximum Bartlett Dam outflows were computed for the 34 "spill" years, then ranked, ordered, and plotted on log-discharge probability paper, using median plotting positions computed for a 105-year period. Tables 5-1 through 5-4 present a summary of the POR simulated outflows. While Bartlett Dam operation was included in the simulation of each POR "spill" for all four plans in order to determine the hydrographs at Granite Reef Diversion Dam, the outflow frequency relationship for Bartlett Dam was singular, i.e. it was identical for each plan, therefore it was determined only once. The simulated maximum inflow and outflow for Bartlett Dam are nearly identical for large flood events due to the limited amount of storage.

(4) GRANITE REEF DIVERSION DAM. Since Granite Reef Diversion Dam has almost no storage, during flood operations, when water is not diverted to the Arizona Canal or the South Canal, the inflow and outflow relationships are identical. The maximum outflow (inflow) to Granite Reef Diversion Dam was determined using the HEC-5 model of the SRP system, which routed POR inflows through the Salt and Verde river reservoirs, and combined the outflows, including estimated intervening flows, at the confluence, and then routed the combined flows to Granite Reef Diversion Dam. The maximum inflows were computed for the 34 "spill" years, then ranked, ordered, and plotted on log-discharge probability paper, using median plotting positions computed for the 105-year period. The POR simulation results for each of the water control plans are included in Tables 5-1 through 5-4.

b. Elevation Frequency - Modified Roosevelt Dam. POR simulated routings for each of the 23 "spills" were performed for all four plans. The maximum resulting water surface elevations were then ranked from 1 to 23 and ordered and assigned median plotting positions based upon a 105-year length of record. These sets of 23 maximum elevations for each plan were then plotted on linear frequency paper, and combined with the annual maximum simulated elevations from SRPSIM for the events ranked from 24 to 105.[20] Tables 5-1 through 5-4 list the maximum water surface elevation and plotting position for each of the simulated 23 events which spilled, for each water control plan, while Table 12 lists this information for the events which did not spill.

2. Synthetic Flood Analysis (Balanced Hydrographs). To aid in determining discharge- and elevation- frequency relationships, synthetic flood hydrographs developed from recorded and estimated observed inflow to Modified Roosevelt Dam and Horseshoe Dam were used. The derivation of these synthetic flood hydrographs has been presented in Section 4, "Balanced Hydrographs", in part "A. INFLOW VOLUME FREQUENCY, 1889-1993" of this Chapter.

a. Determination of Starting Storage The key to obtaining representative results using synthetic flood hydrographs for systems with carryover storage is the starting storage in the reservoir at the beginning of the simulation. In the case of the SRP system there are 6 reservoirs, which amplifies this problem.

Reservoir inflow and initial storage are generally independent parameters, although there may be some serial correlation at a low-level. As a consequence, application of the total probability theorem is theoretically the proper approach to determine the impact of initial storage upon reservoir outflow, i.e. developing outflow frequency relationships based upon all the possible combinations of starting storage and inflow.[21] However, there are usually rational alternatives to the "complete" solution, which are logically supported and produce reasonable results. For example, reservoir systems often have characteristic operating rules, and runoff may have a seasonal or predictable nature which permits estimation of the combination of starting storage with large runoff events for simulation purposes. These types of "typical" or representative situations may be inferred from observed events and bolstered by sensitivity analyses. In the case of the SRP system, determination of initial reservoir conditions to be used in conjunction with synthetic flood hydrographs was accomplished using the following procedure:

(1) The lower Salt River reservoirs (i.e., below Modified Roosevelt Dam) are typically operated for hydropower generation, including pumped-back storage, and are maintained at or near normal water surface elevation (NWS) whenever possible. Some evacuation of space may be made in advance of a flood to accommodate local inflow. SRPSIM results indicate that the long-term average storage for the lower Salt River reservoirs is approximately 350,000 ac-ft; the total storage capacity at NWS of these reservoirs is approximately 373,000 ac-ft. Based upon this information, the starting storage for the lower Salt River Reservoirs was set at approximately 90%, to allow for drawdown prior to forecasted inflow.

(2) The total storage available in the Verde River reservoirs, at NWS is approximately 310,000 ac-ft. Large inflow events usually fill any space remaining

---

20 The reader is reminded that the SRPSIM annual maximum water surface elevations for the events which did not fill the water supply pool are independent of any water control plan. Hence they are identical for each plan.

21 This could be accomplished using some brute force process such as Monte Carlo, but would require time-consuming reservoir routing processes in each mix of inflow and storage. Alternative procedures, involving integration of a range of simulated events linking a series of initial storages/elevations, each with a range of probability, combined with the probability of each of the nominal inflow events are comprehensive, but unachievable within ordinary study confines.

in the Verde River system and spill. Operation often involves anticipatory releases, based upon forecasted inflow, in order to maintain the system integrity and reduce downstream peak discharge. The initial storage on the Verde system is less sensitive than storage in Theodore Roosevelt Lake because of the relative ratio of inflow volume to storage. As a consequence, the Verde River reservoirs "spilled" in 34 of the 105 years based upon SRPSIM results (32% of the years) compared to 23 years (21.9%) for Modified Roosevelt Dam. Figures 4-1 through 4-4 depict the chronologic sequence of annual maximum storage (in % of space filled) for Theodore Roosevelt Lake, Horseshoe Reservoir, and Bartlett Reservoir.

(3) The NWS elevation behind Modified Roosevelt Dam is 2151, which corresponds to approximately 1,610,000 ac-ft of storage space (current sediment survey). Based upon SRPSIM EOM data from the 105-year simulation period, the simulated storage at Theodore Roosevelt Lake has ranged from almost dry (14,700 ac-ft in 1900 and 1902-1904[22]) to full during many periods (see Figure 4-1, annual maximum % space filled). Thus the impact of starting storage in Theodore Roosevelt Lake for synthetic flood simulation can be extreme.

(4) However, another means of estimating starting storage for the Verde River reservoirs and for Theodore Roosevelt Lake was available from SRPSIM results. Volume frequency relationships could be developed for 1-, 2-, and 3-month "spills" for the 105-year simulation period based upon SRPSIM output. To accomplish this, the annual maximum "spill" for these durations was extracted from the yearly summaries (Appendix E), converted to flow rates, ranked, ordered, and plotted on log-discharge probability paper.

The volume of "spilled" water downstream of Bartlett Dam is independent of any water control plan for Modified Roosevelt Dam. In addition, the volume of water "spilled" from the Lower Salt River dams and over Granite Reef Diversion Dam is also independent of the water control plan for durations typically exceeding 10-days. Therefore, synthetic floods could be routed through the SRP dams using HEC-5 in a feed-back process to determine the starting storage which reproduced the "spill" volume downstream. These starting conditions could then be attached to into each synthetic flood, and used to compute peak flows for each of the water control plans. Table 6 lists the starting storages developed in this feed-back process which produced volumes which were consistent with SPRSIM results. These starting storages were determined using only the 3-month volume of "spills" from the SRPSIM results for computational ease. Since the synthetic flood hydrographs developed for inflow to the SRP system represented a duration of flow for each nominal frequency for 90-consecutive days, they could be compared to the 3-month SRPSIM "spill" from the lower Salt River reservoirs (Stewart Mountain Dam), Bartlett Reservoir, and Granite Reef Diversion Dam. Because the "average" flow is an output from the HEC-5 model, the 90-day volume of water "spilled" at each location specified above was directly available. The 90-day volumes from the synthetic hydrographs were easily compared to the SRPSIM 3-month

---

[22] To emphasize the variability of storage, Roosevelt Lake was essentially dry at the beginning of the December 1904 (SRPSIM), and nearly full by the end of March 1905. In April of that year more than 600,000 ac-ft of water were "spilled" from Modified Roosevelt Dam.

volumes by plotting the HEC-5 volume (adjusted to flow rates) with the nominal frequency of each synthetic flood on the log-discharge probability paper with SRPSIM POR results for each of the 3 locations. Starting storages were adjusted until the synthetic flood hydrograph results reproduced the POR results. Figures 23-1 through 23-3 present a comparison of SRPSIM POR data to adjusted synthetic flood hydrograph results. This calibration process assured that the BHFs reproduced long-duration "spills" from the SRP system. However, peak flows resulting from this process were yet very dependent upon the combination of initial reservoir storage and the *shape* of the synthetic flood hydrograph. Since the pattern hydrograph used was the 1993 flood with the peak in the initial stage of the event, the subsequent synthetic flood hydrographs were similar. Consequently, space available in the SRP reservoir system at the beginning of these synthetic flood routings often was capable of storing or attenuating the peak inflow. The variability of the storage space and its affect on the maximum water surface elevation and peak outflow for very large events (> 100-yr) diminished (see Figures 22-1 and 22-2 which compare the starting storage assumption to a "full" reservoir condition and to the POR maxima on a probabilistic basis). Rather than read just the "shape" of the synthetic flood hydrographs or adjust other parameters to assure agreement between POR maxima and routed synthetic flood maxima, the calibration process based on volumes alone was used. However, because the purpose of utilizing synthetic floods was to augment POR results, the synthetic floods routing results were only used to estimate the rare events, for which extrapolation from POR results would be necessary. All frequency analyses performed to determine reservoir elevation, reservoir outflow, and combined regulated downstream runoff utilized POR and synthetic flood routings, and both sets of data are provided on the appropriate figures.

b. Flood Routings. The starting storages listed in Table 6 were input into the HEC-5 simulation models for each of the water control plans and outflow/elevation at Modified Roosevelt Dam, along with outflow from Stewart Mountain Dam, Bartlett Dam, and Granite Reef Dam were generated for each frequency flood. The discharges were then plotted on log-discharge probability paper along with the POR results previously discussed. In a similar manner, the elevations for Theodore Roosevelt Lake were plotted on linear probability paper with the POR results. Figures 25-1,-2,-3 through 28-1,2-,-3 present the flood routings for the 100-, 200-, and 500-year floods for each water control plan.

3. Combined Results. Graphical interpretations of the simulated POR and synthetic flood hydrograph data were made to determine outflow- and elevation-frequency relationships. The results for all four plans are summarized in Table 1.

The graphical interpretation of discharge frequency relationships for Modified Roosevelt Dam are shown on Figures 11 and 12 for P6OP2.

The elevation frequency curve for Modified Roosevelt Dam involved construction of a smooth curve from the combined POR and synthetic flood simulated water surface elevation data for elevations above 2151 ft, NGVD, the bottom of the flood control pool. Elevation frequency values were coordinated with outflow frequency values to ensure that the scheduled outflow had the same frequency of exceedance as the corresponding elevation. Figure 13 displays the elevation frequency relationship for the Recommended Plan.

The peak outflow frequency curve for Stewart Mountain Dam resulting from the Recommended Plan was constructed graphically to fit both the POR and synthetic data, and is shown on Figure 14-1. In a similar manner, the peak outflow frequency curve for Bartlett Dam was constructed graphically to fit the plotted data, and is shown on Figure 14-2. Figure 15-1 displays a graphical discharge frequency curve for the Salt River at Granite Reef Diversion Dam, based upon POR simulations as well as synthetic flood simulations. Volumetric information for the Salt River below Stewart Mountain Dam (based upon the Recommended Water Control Plan), resulting from SRPSIM results is included on Figures 34-1 through 34-3, while volumetric information for the Verde River below Bartlett Dam is included on Figures 35-1 through 35-3.

E. WATER CONTROL PLAN SELECTION

Since no economic evaluation was performed for the water control plans, differentiation between various plans was based on subjective criteria. The basis for, and selection of the Recommended Water Control Plan is presented herein.

1. Criteria

a. Frequency of Exceeding Elevation 2175. Elevation 2175 is the top of the flood control pool at Modified Roosevelt Dam. Exceeding this elevation can result in inundation of private property adjacent to the reservoir, and should be avoided, if possible. Figures 29-1 through 29-4 compare the elevation frequency results from the POR simulations for each water control plan.

b. Water Control Plan Flexibility. The water control plans evaluated were in two separate categories - fixed release plans (*P925K* and *P9OP1*), and stepped release plans (*P6OP1* and *P6OP2*). As presented in the Water Control Manual, deviations from the Recommended Water Control Plan are permissible when changing conditions make it expedient to operate in a manner which varies from that schedule. The stepped release plans are inherently more flexible because they react by design to changing conditions at Modified Roosevelt Dam -

- scheduled releases are minimized during small flood flows and/or when a large percentage of the flood space is available
- progressively larger releases are scheduled as available flood space becomes limited
- releases are scheduled to take advantage of hydroelectric power generation capability of the Salt River system, minimizing the "wasted" water, while maintaining sufficient flood space to control the reservoir design flood (SPF).

In addition, two of the water control plans are "real-time" plans, in which scheduled releases are a function of reservoir stage as well as releases from Bartlett Dam and intervening runoff.

c. Downstream Peak Discharge The "real-time" plans (*P9OP1*, *P6OP2*) attempt to limit the combination of flows, including releases from Modified Roosevelt Dam which are passed through Stewart Mountain Dam, to 180,000 ft^3/s at Granite Reef Diversion Dam. All four plans investigated limit the 100-year discharge at Granite Reef Diversion Dam to 175,000 ft^3/s, which is less than the discharge capacity of the majority of the bridges across the Salt River (see Figure 18). Because of the absence of Cliff Dam (see

Chapter I, "**INTRODUCTION**", under "BACKGROUND"), discharges in excess of the downstream bridge capacity result for less frequent flood events. There are existing facilities, as well as proposed future facilities, e.g. the Rio Salado project, which will suffer damage during events with peak discharges less than 180,000 ft^3/s. However, based upon simulation of the POR, operating to prevent damage to these facilities is impractical without flood protection on the Verde River. Figure 14-2 includes a peak discharge frequency curve for the Verde River below Bartlett Dam, exclusive of the contribution from the Salt River watershed.

d. Salt River Project (SRP) System Operation.

(1) MINIMIZING DAMAGE. Previously in Chapter III, "**TECHNICAL ANALYSIS**", under part "B. WATER CONTROL PLAN FORMULATION", discharges at which damages to the SRP system begin or threaten were discussed. The stepped release plans result in lower water surface elevations during large flood events (see Table 4), hence less frequent damaging flow over the spillways.

(2) MAXIMIZING BENEFITS. Flood control releases which are necessary to ensure the safe passage of floodwater through Modified Roosevelt Dam can be utilized by the operators of the SRP system to generate hydropower under controlled conditions. Hydropower generating capacity ranges from 6500 ft^3/s at Horse Mesa and Mormon Flat dams to 2200 ft^3/s at Modified Roosevelt Dam to 1900 ft^3/s at Stewart Mountain Dam. Because of the disparity in turbine capacity, releases which exceed 1900 ft^3/s result in some "wasting" of water, i.e. water released at a higher rate is bypassed at Stewart Mountain Dam, thus it does not produce as much hydropower as if it could have remained in storage and been released later. The stepped increase plans attempt to limit this waste using a release schedule "tuned" to controlling the SPF with increasingly larger flood releases, postponing turbine bypass as much as possible.

2. Selection. The Recommended Water Control Plan is *P6OP2*, the stepped-release, real-time plan. This water control plan provides the best mix of minimizing the frequency of exceeding the top of the flood control pool, maximizing operational flexibility, minimizing downstream discharges during large flood events, minimizing damaging releases within the SRP system, and maximizing hydropower generation during flood control regulation. A summary comparison of the Design Flood routings and operational aspects for the various plans follows:

WATER CONTROL PLAN COMPARISONS	P6OP1	P6OP2*	P925K	P9OP1
Design Floods:[1]				
SPF PEAK at Confluence	219,000	193,000	205,000	180,000
Maximum Design Outflow	39,500	53,100	25,000	25,000
Maximum Design W.S.El.	2174.57	2174.77	2173.41	2174.58
Maximum IDF Outflow	150,000	150,000	150,000	150,000
Maximum IDF W.S.El.	2217.39	2217.60	2216.43	2217.50
Flood Pool Frequency[2]	4.4-yrs	4.4-yrs	4.4-yrs	4.4-yrs
Spilling Frequency[3]	200-yrs	250-yrs	166-yrs	166-yrs
100-yr Release	39,500	39,500	25,000	25,000
100-yr Discharge at the Confluence	175,000	175,000	175,000	175,000
Operational Aspects:				
type operation	stepped releases	stepped releases	outflow=inflow inflow<25,000[5]	outflow=inflow inflow<25,000[5]
real time operation	no	yes	no	yes
downstream objective	no	<180,000[5]	no	<180,000[5]
flexibility	yes	most	limited	limited
hydropower consideration	maximizes	utilizes fully	no	no
system damage[4]	none	minimum	none	none

* **RECOMMENDED WATER CONTROL PLAN**
[1] All Design Discharges are in ft^3/s.
[2] Flood Pool Frequency refers to the frequency at which elevation 2151, the top of the water supply pool (bottom of the flood control pool), is exceeded.
[3] Spilling Frequency refers to the frequency at which elevation 2175, the top of the flood pool, is exceeded.
[4] None of the water control plans will result in system damage within the flood pool, but damage will ensue with increasing elevations/releases. Since the Recommended Plan minimizes the frequency of exceeding the flood pool, it minimizes the frequency of damaging releases.
[5] Discharge in ft^3/s.

Comparisons of elevation frequency information and outflow frequency information at Modified Roosevelt Dam for the water control plans are included in Figures 29-1,-2,-3,-4 through 33-1,-2,-3.

Discharge/elevation frequency relationships at Modified Roosevelt Dam and discharge frequency relationships at Granite Reef Diversion Dam for the water control plans are compared in Table 1. Peak discharge/elevation frequency curves are presented on Figures 13,14-1, and 15-1; volume frequency curves for the Salt River below Stewart Mountain Dam are shown on Figures 34-1,-2,-3 for the Recommended Water Control Plan.

3. Viability of the Recommended Plan Results. The releases scheduled for each step are consistent with LAD understanding of the operational aspects of Modified Roosevelt Dam, including types and capacities of various outlet/bypass features, best use of these features, and releases at which damage to SRP system facilities is impending. During emergencies, or during occasional extended time periods (based upon known aberrant conditions[23]), it may be advisable or become necessary to operate Modified Roosevelt Dam in a manner which is inconsistent with the Recommended Plan.

Note: Deviation from the recommended plan may result in discharge and elevation frequency relationships which are inconsistent with those presented herein, and may also result in water being stored above elevation 2151 for longer periods than approved in the EIS.

F. DOWNSTREAM VOLUME FREQUENCY RELATIONSHIPS - SELECTED WATER CONTROL PLAN, GRANITE REEF DAM TO GILA RIVER CONFLUENCE

1. General. To provide additional information of value to local agencies, and to regulators of the Salt River, flow duration information has been developed for the Salt River at Granite Reef Diversion Dam and the Salt River at the mouth (confluence with the Gila River) as a part of this study. These relationships include 1-, 2-, 3-, 4-, 5-, 10-, 30-, 60-, and 90-day durations with Modified Roosevelt Dam in place and operated according to the Recommended Water Control Plan (*P6OP2*). The development of the volume frequency relationships is discussed in the following sections of this report.

a. SRPSIM. "Spills" for 30-, 60-, and 90-day durations were available from this POR monthly simulation (see Appendix E) for the Salt River at Granite Reef Diversion Dam. These volumes are independent of the water control plan, since early evacuation of the flood control pool (within 20-days) is the objective of each plan. Hence, these long duration releases were taken directly from SRPSIM and converted to flow rates for each duration. The resulting POR 30-, 60-, and 90-day flows were ranked and ordered and assigned median plotting positions (based upon the simulated 105-year POR), and the discharges were plotted on log-frequency probability paper. For simplicity these long duration discharges were not routed to the downstream location, the confluence of the Salt River with the Gila River.

Note: although there are percolation losses and evaporation losses, as the duration of runoff increases these losses are minimal; bank return after passage of the peak often results in a reclamation of much of the lost water.

---

[23] Aberrant conditions refers to temporary conditions which were not addressed within this study, but which may be given operational priority for a limited time period through mutual agreement between the LAD and the USBR.

b. POR. The 34 largest "spills" at Granite Reef Diversion Dam were determined through use of 6-hour simulated reservoir/streamflow routing using the HEC-5 computer program. Discharges for maximum 6-hour (referred to as peak flow) duration, as well as 1-, 2-, 3-, 5-, and 10-day durations were tabulated for each of these 34 events. The results were ranked and ordered and assigned median plotting positions (based upon the simulated 105-year POR), and plotted on log-frequency probability paper.

c. Synthetic Flood Analysis (Balanced Hydrographs). Synthetic floods for the 2-, 5-, 10-, 20-, 50-, 100-, 200-, and 500-year events generated for inflow to the SRP system were routed and combined at Granite Reef Diversion Dam (see previous discussion in part "D. OUTFLOW/ELEVATION FREQUENCY RELATIONSHIPS" of this chapter for details). These discrete frequency hydrographs were then use to compute the maximum discharge for each duration of interest, and the results were plotted on log-frequency probability paper using the nominal frequency of each synthetic flood. Smooth curves were constructed to fit the duration frequency discharges. Figures 15-1 and 36-1 through 36-10 present discharge frequency curves for peak through 3-month durations for Granite Reef Diversion Dam.

d. Channel Routing. Channel routing parameters, for the Salt River between Stewart Mountain Dam and Granite Reef Diversion Dam, and for the Verde River between Horseshoe Dam and Bartlett Dam, and Bartlett Dam and Granite Reef Diversion Dam, were developed in the study leading to the 1982 CAWCS Hydrology report, and are republished within this report as Table 8. Channel routing data (cross-sections and water surface elevations along with Manning's roughness coefficients, bed slopes, and lengths between cross-sections) was developed for the Flood Control District of Maricopa County (FCDMC) and augmented by the LAD Hydraulics' Section during the course of this study for the reach of the Salt River between Granite Reef Diversion Dam and the Gila River confluence. Channel routing in this reach was simulated using two procedures:

(1) STORAGE ROUTING (MODIFIED PULS). Cross-sectional information was composited into a single 6-hour routing reach (based on travel time between Granite Reef Diversion Dam and the Gila River for velocities associated with significant spills/releases) using the total channel storage for a series of discharges. The storage volumes determined recently were similar to the volumes determined for "ultimate development" in a 1989 LAD study conducted for FCDMC. Modified Puls routing data for the reach of the Salt River from Granite Reef Diversion Dam to the Gila River confluence are shown in Table 11, and on Figure 38-1.

(2) MUSKINGUM-CUNGE. The Muskingum-Cunge routing technique is an effective and appropriate technique for routing rapidly varying channel flow. It is a non-linear coefficient method that accounts for hydrograph diffusion based on physical channel properties and the characteristics of the inflow hydrograph, e.g., shape and volume. However, this technique is available in HEC-1, but unavailable in HEC-5. Use of this streamflow routing procedure in conjunction with HEC-5 reservoir routing requires a data interface to which the HEC-5 hydrographs can be downloaded, and from which these hydrographs can be uploaded to HEC-1. Such a tool, called the HEC Data Storage System (DSS), was utilized for that purpose in this study.

A major advantage of the Muskingum-Cunge routing technique is that there is only one time interval at which the solution converges and it is determined internally. The solution at each reach for the internally computed time interval is then converted back to the user-specified computation interval, prior to subsequent operation. To ensure that the user-specified "solution" does not produce a cumulative "error" as the routed hydrograph moves downstream, the user-specified time interval and resulting peak discharge should be compared to the internally computed values. If the peak outflow is markedly different, the user-specified time period should be adjusted toward the internal time period. When the peak discharges compare favorably, the user-specified time period is adequate. In this application the user-specified time period was 6-hours. The variance between internally computed discharge and "converted" discharge was less than 5% and considered acceptable. Comparison of routed discharges at the confluence indicated some variation in peak flow between the storage routing technique and the coefficient technique. Because this variation was small, and because of the additional steps required to incorporate the Muskingum-Cunge method, storage routing results were determined to be adequate for use in this study.

e. Local Intervening Runoff.

(1) AT GRANITE REEF DIVERSION DAM.

(a) Simultaneous Runoff. In general, coincident local intervening runoff for most flood events is cumbersome to compute, and requires operational data for reservoirs (including periodic storage changes during a flood), along with additional gaged or estimated peak flows on tributary streams. This information was only available and fully developed for several flood events, e.g. March 1978, December 1978, and February 1980. Corresponding information on a broader scale is also available for early periods within the systematic record when concurrent gaged information was available. Based upon this information, and in lieu of specific knowledge of local intervening runoff during the majority of the flood events, a factor of 8% of the upstream system inflow was used to estimate local intervening runoff. This percentage is consistent with the ratio of the area contributing to the upstream system and the downstream intervening area. Flood events for which the local intervening runoff had been estimated in more detail were simulated using the computed runoff and compared to the ratioed runoff with no significant differences. Thus, the ratio was used for all POR short time-interval routings as well as synthetic hydrographs.

(b) Non-simultaneous Runoff. Non-coincident runoff to the Salt River was developed during the hydrologic analysis leading to the publication of the May 1982 CAWCS Hydrology Report, and is described in Appendix 1 of that report. Local or intervening runoff can occur simultaneously with releases from the SRP system when it is a result of the same storm event, or during the same event, but non-coincident with release from the SRP system. Both of these cases are included in the preceding discussion and the results are incorporated into the discharge frequency evaluation. In addition the intervening or local runoff can result from a separate event; in this case it is not addressed in the reservoir routing analysis.

Local inflow frequency curves were derived for a series of locations along the Salt River (Appendix 1, May 1982 CAWCS Report) and their impact on peak discharge frequency relationships was evaluated. These non-coincident local flows affected the mainstem peak discharge frequency relationships for alternatives which greatly reduced the runoff in the

Salt River (e.g. for Plan 6 with a proposed target discharge of 50,000 ft^3/s). Since the Recommended Plan has a target discharge of 180,000 ft^3/s, the impact of non-coincident local runoff is minimal. Computations of peak discharge in the Salt River at Granite Reef Diversion Dam were made to determine the probabilistic impact of these non-coincident events and are presented in the following tabulation. As shown in this tabulation, the impact of local non-coincident inflow to the Salt River is insignificant for the purposes of this study, and was not included in downstream computations.

PROB (%)	DISCHARGE, Q1	LOCAL FLOW[1], Q2	REFERENCE EVENT, E	PR(Q>E)		ΣPR
				P1	P2	
.2	250,000	88,000	250,000	.002	≈0	.002
.5	210,000	65,000	210,000	.005	≈0	.005
1.0	175,000	51,000	175,000	.01	≈0	.01
2.0	150,000	38,000	150,000	.02	≈0	.02
5.0	100,000	23,000	100,000	.05	≈0	.05
10.0	60,000	14,000	60,000	.10	.003	.103
20.0	22,000	8,000	22,000	.20	.03	.23

[1] see plate 1-11, Appendix 1, May 1982 CAWCS Hydrology Report
NOTE: all discharges in ft^3/s

(2) BELOW GRANITE REEF DIVERSION DAM. Storm water runoff to the Salt River between Granite Reef Diversion Dam and the Gila River Confluence is mainly from two sources: Indian Bend Wash, and storm drains constructed by the Arizona Department of Transportation, the City of Tempe, and the City of Phoenix, which may convey water to the Salt River, but in insignificant quantities in comparison to peak discharges and volumes of spills over Granite Reef Diversion Dam. None of these sources contributes quantities which alter the peak discharge in the Salt River during flood events. However, during non-flood flows, i.e. frequent events, or during the non-flood season, local runoff may be the major source of inflow to the Salt River (The impact of local inflow was addressed in the preceding section at Granite Reef Diversion Dam. The impact diminishes as the analysis moves downstream because the amount of additional area drained decreases). In addition to these sources of storm water, treated sewage effluent from both the 23rd Avenue Wastewater Treatment Plant, which provides secondary treatment and dechlorination to 30 Million Gallons per Day (MGD), with capacity to treat 57 MGD[24],

[24] NOTE: 1 MGD = 1.55 ft^3/s. Hence 57 MGD = 88 ft^3/s.

and the 91st Avenue Wastewater Treatment Plant (treatment capacity of 153 MGD[25]), outlets to the Salt River. The amount of sewage effluent returned to the Salt River is incidental in comparison to peak flow rates resulting from spills over Granite Reef Diversion Dam.

2. Granite Reef Diversion Dam.

a. Results. The 3 components of duration discharges were combined into a set of volume frequency discharges and a smooth family of curves constructed to fit the data. The POR routing results are shown in Table 9-1. The peak discharge frequency curve is shown on Figure 15-1. An array of frequency curves for the Recommended Water Control Plan (P6OP2) for each selected duration are displayed in Figures 36-2 to 36-10, and the entire set of volume frequency curves are shown on Figure 36-1. Volume frequency relationships were only developed for the Recommended Water Control Plan. As previously mentioned, the difference between releases for the various water control plans diminishes as the duration increases. Hence duration discharge was not used as a parameter for determining the Recommended Water Control Plan.

Peak frequency discharges at Granite Reef Diversion Dam for each of the four water control plans evaluated are displayed in Table 1. Peak flows were routed to the Gila River for the Recommended Water Control Plan only, since the water control plans were not developed to control flow in the Gila River.

b. Comparison to Without Project Conditions. Duration discharges for each of the 34 "spills" are included in Table 9-1. Table 10 presents a comparison of simulated w/ and w/o project discharges for significant "spills". A comparison of the without project peak discharge frequency curve (developed during the 1982 CAWCS) to the peak discharge frequency curve for the Recommended Water Control Plan is shown on Figure 15-3. Table 2-4 summarizes peak discharge frequency relationships from Granite Reef Diversion Dam to Gillespie Dam with the Recommended Water Control Plan and provides a comparison of these "with project" discharges to "without project" discharges.

3. Above the Gila River Confluence. For the Recommended Water Control Plan, the 34 short time-interval POR "spills" along with the synthetic flood hydrographs were routed to the Gila River confluence, and the maximum discharges for each duration (peak to 10-day) were computed. In addition, the SRPSIM maximum 1-, 2-, and 3-month "spills" at Granite Reef Diversion Dam were used directly to provide a full spectrum of duration discharges. Volume frequency curves were constructed in a manner similar to that discussed for Granite Reef Diversion Dam. The POR routing results for durations from peak to 10-day are presented in Table 9-2. The peak discharge frequency curve is shown on Figure 15-2. An array of discharge frequency curves for each duration are presented in Figures 37-1 through 37-10; the set of volume frequency curves is displayed on Figure 37-1. Volume frequency relationships were only developed for the Recommended Water Control Plan.

4. Below the Gila River Confluence. Coolidge Dam controls nearly half of

---

[25] Per footnote 24, the daily flow rate = 237 ft^3/s. However, contractual obligations to the Palo Verde Nuclear Generating Power Plant for approximately 123 MGD (190 ft^3/s) limit the quantity of effluent which is wasted to the Salt River. The water supplied for coolant to the nuclear power plant is provided through a pipeline. The actual use ranges from 0 to 90 MGD (139 ft^3/s). The Buckeye Irrigation Company also has a contract for effluent, 31.5 MGD (49 ft^3/s), but takes its contractual water from a diversion structure on the Gila River.

the drainage area of the Gila River upstream of the Salt River confluence (12,900 sq.mi. out of 26,800 sq.mi.), and has experienced only 1 significant spill since its closure in 1928 - in 1993 more than 1 million ac-ft of water, with a peak of more than 30,000 ft^3/s. Prior to construction of Coolidge Dam, large inflow events occurred in the years 1891, 1905, and 1916, which would also have spilled (based upon determinations made during the hydrologic study for the 1982 CAWCS report). In addition, runoff from the intervening area between Coolidge Dam and the Salt River (drainage area=13,800 sq.mi., including the San Pedro River and the Santa Cruz River) occasionally is of sufficient peak and sustained volume that it maintains flow in the Gila River for several days. The two most notable events of this type are the September 1926 and October 1983 floods which generated peak flows in the Gila River in the vicinity of 100,000 ft^3/s. Since the 1993 spill from Coolidge Dam and the 1983 runoff from the San Pedro and Santa Cruz river are the only two events of any significance since the completion of the 1982 CAWCS, their relative impact on the runoff from the upper Gila River (above the Salt River) was weighted with the previous results. The October 1983 event had a larger peak discharge (approximately a 10-year flow), while the 1993 spill from Coolidge was important from volumetric aspects. The peak discharge frequency relationship for without project conditions, developed for the 1982 CAWCS Hydrology Report (plate 15 of that report), was not altered because of these two events. A with project frequency curve based upon the impact of the Recommended Plan on peak flow in the lower Gila River (below the Salt River) was developed by modifying the discharge for a series of discrete frequencies in the manner developed for the 1982 CAWCS Hydrology Report, and utilized when analyzing alternatives for the "Hydrologic Analysis of Cliff Dam Alternatives", September 1988, LAD. This simplified approach was tested for a wide range of Salt River flood control alternatives and found to provide acceptable results. As determined during the 1982 CAWCS Hydrology, the potential for error increases as the Salt River target peak flow decreases and the level of protection increases. The Recommended Water Control Plan has a much higher target discharge (180,000 ft^3/s versus 50,000 ft^3/s) than the original Plan 6 could achieve with flood control on both the Salt and Verde rivers. Hence the impact on the downstream peak flow in the Gila River is much less. The computation of peak frequency discharges for the Gila River below the Salt River is provided in the following:

PR (%)	W/O PROJECT DISCHARGE LOWER GILA RIVER	W/O PROJECT DISCHARGE SALT RIVER ABOVE GILA RIVER	W/ PROJECT DISCHARGE SALT RIVER ABOVE GILA RIVER	Δ DISCHARGE SALT RIVER	W/ PROJECT DISCHARGE SALT RIVER ABOVE GILA RIVER
0.2	360,000	310,000	235,000	75,000	285,000
0.5	295,000	250,000	198,000	52,000	243,000
1.0	250,000	185,000	162,000	23,000	227,000
2.0	200,000	145,000	130,000	15,000	185,000
5.0	135,000	125,000	82,000	43,000	92,000
10.0	95,000	85,000	49,000	36,000	59,000
20.0	40,000	36,000	19,500	16,500	23,500
NOTE: all discharges are in ft^3/s					

This discharge frequency relationship, along with the components which aided in its development, are shown on Figure 15-4a. The POR peak discharges for the Salt River above the confluence with the Gila River, with Modified Roosevelt Dam operated using the Recommended Water Control Plan, *P6OP2* (see Table 9-2), were used to adjust the peak discharges for the Gila River downstream from the Salt River confluence obtained from Table 3-6 of the 1982 CAWCS Hydrology Report. Additional data for the years from 1980 to 1993 was developed from the gaged information at Gillespie Dam, combined with the POR "spills" from Table 9-2 . For example, the March 1983, March 1985, and January 1993 peak discharges were based upon the POR "spills", while the peak flows during the remaining years were based upon runoff from the Gila River drainage area excluding the Salt River. The maximum 70 adjusted flows for the Gila River below the Salt River confluence are shown in Table 9-3. The peak discharge frequency curve computed in the previous table is overlain on the adjusted POR discharges and displayed on Figure 15-4b.

G. DOWNSTREAM DISCHARGE FREQUENCY RELATIONSHIPS - RECOMMENDED WATER CONTROL PLAN, GILA RIVER CONFLUENCE TO GILLESPIE DAM

1. Channel Routing. Storage versus discharge relationships based upon HEC-2 water surface profiles were developed by the LAD for FCDMC in 1989 for this reach of the Gila River and the results were used in this study. These relationships are shown in Table 11, and on Figure 38-2 through 38-4. Routing relationships (Figure 39) between the confluence of the Salt and Gila Rivers and Waterman Wash and Gillespie Dam were developed by routing the synthetic flood hydrographs between these locations using the storage volumes developed from HEC-2 water surface profiles. These routing curves were

then used to estimate peak discharges for the Gila River at Waterman Wash and at Gillespie Dam (Table 2-3) by comparing the computed peak discharge for discrete frequency events at the Salt-Gila confluence to the routing curves, and reading the expected peak flow at both downstream locations. Table 2-2 presents the peak discharge frequency relationships for the Gila River from the Salt River confluence to Gillespie Dam. A profile of frequency discharges for the Salt and Gila rivers is included as Figure 40. Table 2-4 summarizes peak discharge frequency relationships along the Salt River and Gila River, from Granite Reef Diversion Dam to Gillespie Dam, with the Recommended Water Control Plan, and provides a comparison of these "with project" discharges to "without project" discharges.

2. Tributary Inflow

a. Agua Fria River (with New Waddell Dam in place). New Waddell Dam, along with the Phoenix projects, has a tremendous controlling impact on runoff from the Agua Fria River. As an example, the 100-year peak discharge in the Agua Fria River at the mouth (the confluence with the Gila River) is reduced from 89,000 ft^3/s without New Waddell Dam to 48,200 ft^3/s with New Waddell Dam (reference 1995 study of Agua Fria River with New Waddell Dam in place, LAD, Chapter **I. INTRODUCTION**, Section E. PREVIOUS REPORTS.). More importantly, as far as the impact on runoff in the Gila River, the peak discharges in the Agua Fria River with New Waddell Dam in place result from flashy summer type events with less volume than the type of runoff event expected to occur prior to completion of the dam. As evidence, the SPF for the lower Agua Fria River is still a significant discharge - 83,000 ft^3/s - but the volume is only about 70,000 ac-ft, and the flood wave has passed within 24 hours. Contrast this to the 100-year, 10-day volume of runoff (a large event, but with a more frequent recurrence interval than the SPF) for the Salt River at the Gila River confluence, which is approximately 1,400,000 ac-ft. The relative magnitude of the Agua Fria River SPF is only about 5% of this volume. And, since it is expected to result from a non-flood season event, i.e. an event outside the Salt River flood season, the peak flow would not be coincident with runoff from the Salt River; consequently, the discharge would be quickly attenuated because of the small amount of volume. Based upon a monthly simulation of the operation of New Waddell Dam performed by the USBR in conjunction with the hydrologic evaluation of the impact of New Waddell Dam on downstream runoff, only four events in the runoff record would produce "spills" - February 1907 and 1920, January 1916, and April 1917 - and none more than 76,400 ac-ft (February 1920). While this event was coincident with a "spill" from the SRP system, the magnitude of the "spill" in the Salt River at Granite Reef Diversion Dam was 1,081,000 ac-ft, approximately 14 times greater. During the other 3 referenced "spills" from New Waddell Dam, the contribution was even less. Hence, mainstem Gila River peak discharge frequency relationships, dominated by winter season floods from the Salt River system or to a lesser degree by general summer type floods from the San Pedro-Santa Cruz rivers, are not affected by thunderstorm type events within the drainage areas of the local tributaries, such as the Agua Fria River.

b. Other Streams. Other major tributaries of the Gila River, such as Waterman Wash, the Hassayampa River, and Centennial Wash produce relatively insignificant quantities of runoff during the general winter flood events which produce the

[redacted]

[redacted]

[redacted]

IV. ADEQUACY OF RESULTS

The two most important factors in developing the Recommended Water Control Plan for Modified Roosevelt Dam are the length (and quality) of available streamflow data and sufficient understanding of the operation of the SRP system to permit an accurate quantitative assessment of impacts of that operation on observed streamflow.

A. AVAILABLE STREAMFLOW DATA

Monthly streamflow data for the Salt and Verde Rivers is available from August 1888 to the present[26]. In addition, daily and peak streamflow is available for some locations within the Salt River basin since 1889 (see Figures 1 and 2). Streamflow data for inflow to the SRP system had been developed for durations of interest, i.e. peak, 1-, 2-, 3-, 5-, and 10-days, along with flood hydrographs for events which "spilled", during the study for the 1982 CAWCS Hydrology Report, using the best available data and regressing the missing duration discharges based upon relationships developed with the available duration discharges. This current study built on that streamflow data base and extended it from 1980 through the 1993 water year. In addition, inflow to the SRP system for durations of 30-, 60-, and 90-days were generated for the entire period.

Monthly streamflow data was also developed for inflow to Coolidge Dam and presented in the 1982 CAWCS Hydrology Report for the period beginning in January 1903 until the construction of Coolidge Dam in 1928. An estimate of the peak discharge in the Gila River for the 1891, 1905, and 1916 floods were made based on available reports. Since closure of the dam, there has been only 1 significant spill event - 1993.

Because of the abundance of gaged streamflow and historical estimates of flood flows, a reliable data base was constructed which due to its relatively long length (105 years for the SRP system inflows) provides a strong basis for the development of streamflow estimates within the basin. In addition results from paleo-flood estimates and tree-ring analyses help to put into perspective the relative quantity of runoff from this historical period to periods of significantly greater length. Thus, the available record is substantial, and provides an excellent base for making estimates of future runoff, given the completion of Modified Roosevelt Dam and operation according to the Recommended Water Control Plan.

B. KNOWLEDGE OF SALT RIVER PROJECT SYSTEM OPERATION

As necessary as the streamflow data itself, is the understanding of the existing SRP system, and the integration of the operation of that system with the AACC and the flood control space being provided by the modification of Roosevelt Dam. A pre-existing system operation model, developed by the USBR during CAWCS, was updated by engineers within the SRP to include water operational rules for the AACC, based upon SRP objectives and downstream requirements. This model, SRPSIM, was utilized by SRP engineers to screen the POR, utilizing the monthly reservoir inflow data developed by the LAD, beginning in water year 1889 and extending through water year 1993, to determine the frequency and quantity of monthly "spills" from the SRP system with Modified Roosevelt Dam in place.

---

[26] In the case of this study, "present" was water year 1993, the period for which data was readily available for analysis. Additional data is now available, as is the case with any study, but would not impact results.

Working in conjunction with the SRP, the LAD determined that the SRPSIM model would meet the preliminary screening objectives. This initial screening process pinpointed the months within the POR when floodflow would occur in the Salt River downstream of Granite Reef Diversion Dam. As a result, a simulated history of the operation of the SRP system, incorporating Modified Roosevelt Dam, was available to LAD engineers. This history included the initial SRP system storage at the onset of all "spills" within that POR, and enabled LAD engineers to determine the hydrologic characteristics[27] of each of these flood events. Because of the availability of the SRPSIM model, and the adaptation of the model to the new configuration of the SRP system, this resulted in not only a higher degree of confidence in the simulation results, but also eliminated the necessity of attempting to model the intricate operation of the SRP system over an extended time period.

---

[27] This statement refers to the maximum elevation of Roosevelt Lake, the maximum outflow from Modified Roosevelt Dam, the Verde River, the lower Salt River reservoirs, and the maximum discharge at Granite Reef Diversion Dam.

V. SUMMARY

All frequency relationships developed within this study were based upon graphical analysis of long-term streamflow data and/or simulated streamflow/elevation data. In each case an attempt was made to fit the observed and/or simulated data as well as possible while utilizing results from synthetic floods (BHFs) to provide additional insight into more infrequent events. No attempt to develop analytical confidence limits has been made. Adjustments to account for expected probability were not made either, since the frequency relationships based upon long-term record were intended to represent the simulated results as well as possible. All data were plotted using median plotting positions, and the record length was equivalent to 105 years at each location. As a result, the frequency estimates have an approximate 50% chance of being exceeded and an approximate 50% chance of being too large. Because of the length of the streamflow record and because it is representative of streamflow for much longer time periods, coupled with the use of the most representative SRP system model, the results of this study are extremely reliable. As a consequence, evaluation and comparison of the water control plans examined in this study is accurate, and the results of operating according to the Recommended Water Control Plan are also extremely reliable.

TABLE 1. COMPARISON OF FREQUENCY RELATIONSHIPS FOR CONCEPT WATER CONTROL PLANS

	Modified Roosevelt Dam Inflow	Modified Roosevelt Dam Outflow				Modified Roosevelt Dam W.S. El.				Bartlett Dam Outflow	Granite Reef Flow			
		P6OP1	P6OP2	P925K	P9OP1	P6OP1	P6OP2	P925K	P9OP1		P6OP1	P6OP2	P925K	P9OP1
500-year	300,000	105,000	105,000	135,000	135,000	2178	2178	2179	2179	200,000	250,000	250,000	250,000	260,000
200-year	255,000	39,500	53,100	90,000	90,000	2175	2173	2176	2176	180,000	210,000	210,000	210,000	210,000
100-year	225,000	39,100	39,100	25,000	25,000	2168	2168	2172	2172	150,000	175,000	175,000	175,000	175,000
50-year	190,000	39,100	39,100	25,000	25,000	2164	2164	2168	2168	115,000	150,000	150,000	150,000	150,000
20-year	140,000	39,100	39,100	25,000	25,000	2159	2159	2160	2160	75,000	100,000	100,000	90,000	90,000
10-year	100,000	12,200	12,200	25,000	25,000	2155	2155	2151	2151	45,000	60,000	60,000	60,000	60,000
5-year	62,000	5,500	5,500	7,000	7,000	2151	2151	2151	2151	18,000	22,000	22,000	25,000	25,000

Notes: (1) all flow in ft^3/s, and elevations in ft, NGVD.
(2) drainage areas for locations listed above -
Modified Roosevelt Dam, 5830 sq.mi.
Bartlett Dam, 5851 sq.mi.
Granite Reef Diversion Dam, 12,600 sq.mi.

TABLE 2-1. VOLUME FREQUENCY RELATIONSHIP WITH RECOMMENDED PLAN (P6OP2):
SALT RIVER AT STEWART MOUNTAIN DAM AND
VERDE RIVER AT BARTLETT DAM

	500-YR	200-YR	100-YR	50-YR	20-YR	10-YR	5-YR
	STEWART MOUNTAIN DAM DA=6221 sq.mi. (Discharge in ft^3/s)						
PEAK	110000	54000	43400	43400	39000	14000	6800
30-DAY	35000	27000	21000	16000	9000	4550	300
60-DAY	27500	20000	15000	11000	6000	3100	275
90-DAY	21000	15750	11500	8500	4900	2700	250
	BARTLETT DAM DA=5851 sq.mi. (Discharge in ft^3/s)						
PEAK	200000	180000	150000	115000	75000	45000	18000
30-DAY	25000	20000	16000	12000	7500	4400	2000
60-DAY	17600	14000	11500	8500	5100	3200	1450
90-DAY	13000	10000	8000	6200	4000	2500	1000

Note: Discharges for durations less than 1-month were not computed for these locations.

TABLE 2-2. VOLUME FREQUENCY RELATIONSHIPS FOR SALT RIVER WITH RECOMMENDED PLAN (P6OP2):
AT GRANITE REEF DIVERSION DAM AND
AT CONFLUENCE WITH GILA RIVER

	500-YR	200-YR	100-YR	50-YR	20-YR	10-YR	5-YR
	GRANITE REEF DIVERSION DAM DA=12,600 sq.mi. (Discharge in ft^3/s)						
PEAK	250000	210000	175000	150000	100000	60000	22000
1-DAY	230000	199000	165000	130000	81000	48000	18000
2-DAY	205000	175000	145000	110000	70000	40000	15500
3-DAY	180000	150000	120000	95000	62000	35000	14000
5-DAY	150000	115000	90000	75000	45000	28000	12000
10-DAY	105000	85000	70000	50000	30000	18000	8000
30-DAY	60000	47000	36000	26000	15000	8000	2700
60-DAY	45000	35000	27000	19500	11000	6000	1900
90-DAY	35000	27000	21500	16000	8900	4700	1400
	CONFLUENCE WITH GILA RIVER DA=13,000 sq.mi. (Discharge in ft^3/s)						
PEAK	235000	198000	162000	130000	82000	49000	19500
1-DAY	220000	185000	155000	122000	78000	46000	17000
2-DAY	205000	175000	145000	110000	70000	40000	15000
3-DAY	178000	150000	120000	94000	62000	35000	13000
5-DAY	140000	115000	90000	75000	45000	28000	10200
10-DAY	100000	85000	70000	50000	30000	17500	8000
30-DAY	60000	47000	36000	26000	15000	8000	2550
60-DAY	45000	34500	27000	19000	11000	6000	1800
90-DAY	34000	26500	21000	15000	8400	4700	1300

TABLE 2-3. PEAK DISCHARGE FREQUENCY RELATIONSHIPS FOR GILA RIVER CONFLUENCE WITH SALT RIVER TO GILLESPIE DAM WITH RECOMMENDED PLAN (P6OP2)

CP	500-YR	200-YR	100-YR	50-YR	20-YR	10-YR	5-YR
BELOW GILA CONFLUENCE[1]	285,000	243,000	227,000	185,000	92,000	57,000	23,500
AT WATERMAN WASH[2]	270,000	225,000	210,000	160,000	68,000	46,000	17,000
AT GILLESPIE DAM[3]	270,000	215,000	195,000	145,000	65,000	38,000	12,000

Note: All discharges in ft^3/s.
[1] Drainage Area = 39,700 sq.mi.
[2] Drainage Area = 41,000 sq.mi.
[3] Drainage Area = 42,400 sq.mi.

TABLE 2-4. DISCHARGE FREQUENCY VALUES SALT RIVER AND GILA RIVER RECOMMENDED PLAN (P6OP2) VERSUS W/O PROJECT

LOCATION		RETURN PERIOD						
		500-YR	200-YR	100-YR	50-YR	20-YR	10-YR	5-YR
PEAK DISCHARGES (ft^3/s) IN SALT RIVER AT:								
CP-40	W/P	250,000	210,000	175,000	150,000	100,000	60,000	22,000
	WO/P	360,000	290,000	245,000	175,000	141,000	102,000	45,000
CP-109	W/P	246,000	207,000	172,000	145,000	95,000	58,000	21,000
	WO/P	345,000	285,000	230,000	170,000	139,000	100,000	44,000
CP-110	W/P	243,000	204,000	169,000	140,000	90,000	55,000	20,500
	WO/P	330,000	275,000	215,000	160,000	135,000	93,000	40,000
CP-111	W/P	240,000	202,000	166,000	135,000	87,000	53,000	20,200
	WO/P	325,000	265,000	200,000	155,000	130,000	91,000	39,000
CP-112	W/P	237,000	200,000	164,000	132,000	84,000	51,000	20,000
	WO/P	315,000	255,000	190,000	150,000	126,000	90,000	38,000
CP-113	W/P	235,000	198,000	162,000	130,000	82,000	49,000	19,500
	WO/P	310,000	250,000	185,000	145,000	125,000	85,000	36,000
PEAK DISCHARGES (ft^3/s) IN GILA RIVER AT:								
CP-1310	W/P	285,000	243,000	227,000	185,000	92,000	57,000	23,500
	WO/P	360,000	295,000	250,000	200,000	135,000	95,000	40,000
CP-1216	W/P	270,000	225,000	210,000	160,000	68,000	46,000	17,000
	WO/P	350,000	290,000	245,000	195,000	133,000	88,000	39,000
CP-1217	W/P	270,000	220,000	203,000	153,000	67,000	42,000	15,000
	WO/P	340,000	280,000	240,000	190,000	129,000	82,000	38,000
CP-1218	W/P	270,000	215,000	195,000	145,000	65,000	38,000	12,000
	WO/P	335,000	277,000	235,000	186,000	124,000	78,000	37,000

DEFINITIONS:
W/P = Recommended Plan, P6OP2. WO/P = without project/existing conditions per 1982 CAWCS Hydrology Report, Table 23.
CP-40, at Granite Reef Dam
CP-109, at Gilbert Road
CP-110, at Tempe Bridge
CP-111, at Central Avenue
CP-112, at 67th Avenue
CP-113, above confluence with Gila River
CP-1310, below confluence with Salt River
CP-1216, below confluence with Waterman Wash
CP-1217, below confluence with Hassayampa River
CP-1218, at Gillespie Dam

TABLE 3. VOLUME FREQUENCY INFLOW TO U/S SRP SYSTEM RESERVOIRS
Adopted Frequency Curve Data

	500-YR	200-YR	100-YR	50-YR	20-YR	10-YR	5-YR	2-YR
	COINCIDENT COMPONENT INFLOW TO ROOSEVELT DAM DA = 5830 sq.mi.							
PEAK	298000	255000	225000	190000	140000	100000	62000	24000
**	320000	260000	215000	175000	122000	90000	60000	
1-DAY	218000	182000	153000	125000	90000	66000	42000	14000
**	220000	180000	150000	125000	90000	66000	43000	
2-DAY	180000	153000	130000	109000	80000	57000	36000	12000
**	180000	150000	130000	109000	80000	58000	37000	
3-DAY	151000	126000	107000	88000	63000	46000	29000	10000
**	150000	125000	105000	88000	65000	47000	30000	
5-DAY	110000	90000	76000	63000	45000	32000	20000	7400
**	110000	90000	77000	63000	45000	32000	20000	
10-DAY	64000	54000	46000	38000	27500	20000	13000	5400
**	64000	55000	46000	38000	27500	20000	13000	
30-DAY	37900	29900	24400	19500	13700	9900	6600	2900
60-DAY	28600	22500	18400	14700	10400	7600	5100	2300
90-DAY	21800	17300	14200	11400	8200	6000	4100	1900
	** Bottom row values from Hydrologic Analysis of Cliff Dam Alternatives, September 1988 report (Reference Plate 3-1, Coincident Component Inflow to Roosevelt Dam, CAWCS Hydrology)							
	COINCIDENT COMPONENT INFLOW TO HORSESHOE DAM DA = 5657 sq.mi.							
PEAK	250000	207000	176000	143000	100000	71000	46000	19000
***	160000	145000	128000	112000	90000	71000	49000	
1-DAY	180000	145000	119000	94000	66000	47000	30500	11000
***	101000	92000	83000	72000	59000	46000	31000	
2-DAY	140000	110000	90000	73000	52000	37000	24000	9000
***	82000	73000	67000	59000	47500	37000	26500	
3-DAY	105000	84000	70000	57000	41000	30000	19500	7600
***	62000	55000	50000	44000	36500	29000	20500	
5-DAY	72000	57000	47000	38500	28000	21000	14000	5600
***	43000	39000	35000	31000	25500	20000	14000	
10-DAY	41000	34000	29000	24000	17500	13000	9000	3700
***	27000	24500	22000	19800	16200	13000	9000	
30-DAY	24000	19300	16000	12900	9200	6700	4500	1900
60-DAY	16300	13100	10900	8900	6400	4700	3200	1400
90-DAY	12500	10100	8400	6900	5000	3700	2600	1200
	*** Bottom row values from Hydrologic Analysis of Cliff Dam Alternatives, September 1988 report (Reference Plate 3-2, Verde River Coincident Component Inflow to Horseshoe Dam, CAWCS Hydrology)							

TABLE 4. PROPOSED WATER CONTROL PLAN REGULATION SCHEDULES MODIFIED ROOSEVELT DAM - PLAN 6 APPROACH VERSUS PLAN 9

WATER SURFACE ELEVATION ft ngvd	"PLAN9-25K" (P925K) NO D/S OPERATION	"PLAN9-OP1"[1] (P9OP1) D/S OPERATION	"PLAN6-40K"[2] (P6OP1) NO D/S OPERATION		"PLAN6-53K"[3] (P6OP2) D/S OPERATION	
	RISING = FALLING		RISING	FALLING	RISING	FALLING
2151	OUTFLOW=INFLOW	OUTFLOW=INFLOW	1900 ft^3/s	6500 ft^3/s	1900 ft^3/s	6500 ft^3/s
2152	25,000 ft^3/s	25,000 ft^3/s	1900 ft^3/s	6500 ft^3/s	1900 ft^3/s	6500 ft^3/s
2153	25,000 ft^3/s	25,000 ft^3/s	2200 ft^3/s	12,200 ft^3/s	2200 ft^3/s	12,200 ft^3/s
2154	25,000 ft^3/s	25,000 ft^3/s	2200 ft^3/s	12,200 ft^3/s	2200 ft^3/s	12,200 ft^3/s
2155	25,000 ft^3/s	25,000 ft^3/s	6500 ft^3/s	12,200 ft^3/s	6500 ft^3/s	12,200 ft^3/s
2156	25,000 ft^3/s	25,000 ft^3/s	6500 ft^3/s	12,200 ft^3/s	6500 ft^3/s	12,200 ft^3/s
2157	25,000 ft^3/s	25,000 ft^3/s	12,200 ft^3/s	12,200 ft^3/s	12,200 ft^3/s	12,200 ft^3/s
2158	25,000 ft^3/s	25,000 ft^3/s	12,200 ft^3/s	39,500 ft^3/s	12,200 ft^3/s	39,500 ft^3/s
2160	25,000 ft^3/s	25,000 ft^3/s	12,200 ft^3/s	39,500 ft^3/s	12,200 ft^3/s	39,500 ft^3/s
2162	25,000 ft^3/s	25,000 ft^3/s	39,500 ft^3/s	39,500 ft^3/s	39,500 ft^3/s	39,500 ft^3/s
2170	25,000 ft^3/s	25,000 ft^3/s	39,500 ft^3/s	39,500 ft^3/s	39,500 ft^3/s	39,500 ft^3/s
2172	25,000 ft^3/s	25,000 ft^3/s	39,500 ft^3/s	39,500 ft^3/s	53,100 ft^3/s	53,100 ft^3/s
2175	25,000 ft^3/s	25,000 ft^3/s	39,500 ft^3/s	39,500 ft^3/s	53,100 ft^3/s	53,100 ft^3/s
2175-2180	SPILLWAY RELEASE IS GRADUALLY INCREASED UNTIL IT REACHES 142,000 FT^3/S AT EL 2180					
2180	142,000 ft^3/s	142,000 ft^3/s	142,000 ft^3/s	142,000 ft^3/s	142,000 ft^3/s	142,000 ft^3/s
2185	146,000 ft^3/s	146,000 ft^3/s	146,000 ft^3/s	146,000 ft^3/s	146,000 ft^3/s	142,000 ft^3/s
2190	150,000 ft^3/s	150,000 ft^3/s	150,000 ft^3/s	150,000 ft^3/s	150,000 ft^3/s	150,000 ft^3/s
≥2218	150,000 ft^3/s	150,000 ft^3/s	150,000 ft^3/s	150,000 ft^3/s	150,000 ft^3/s	150,000 ft^3/s

1 Maximum release from Roosevelt Dam + local intervening runoff + Verde River releases limited to 180,000 cfs.

2 Maximum release from Roosevelt Dam + local inflow to Horse Mesa limited to 39,500 cfs

3 Maximum release from Roosevelt Dam + local intervening runoff + Verde River releases limited to 180,000 cfs NOTE: **RECOMMENDED PLAN**

TABLE 5-1. POR SIMULATION RESULTS - WATER CONTROL PLAN P925K

See Table 4 and Chapter III, Section C for Presentation of Water Control Plans

RANK	MEDIAN PP	SIMULATION DATE	OUTFLOW MODIFIED ROOSEVELT (ft^3/s)	SIMULATION DATE	OUTFLOW STEWART MTN (ft^3/s)	SIMULATION DATE	OUTFLOW BARTLETT (ft^3/s)	SIMULATION DATE	OUTFLOW GRANITE REEF (ft^3/s)	SIMULATION DATE	WSE ROOSEVELT LAKE (ft, NGVD)
1	0.007	Feb 1891	134000	Feb 1891	111000	Feb 1891	147000	Feb 1891	249000	Feb 1891	2175.39
2	0.016	Feb 1980	25000	Mar 1941	32000	Jan/Mar 93	129000	Jan/Mar 93	161000	Feb 1980	2168.28
3	0.026	Jan 1916	25000	Jan 1916	31500	Feb 1980	91100	Feb 1980	124000	Jan 1916	2166.48
4	0.035	Jan/Mar 93	25000	Feb 1980	31200	Feb 1890	82100	Feb 1890	110000	Jan/Mar 93	2164.82
5	0.045	Mar 1941	25000	Jan/Mar 93	31200	Mar 1978	80600	Feb 1920	95600	Mar 1941	2161.44
6	0.054	Feb 1920	25000	Feb 1890	30400	Feb 1920	69400	Jan 1916	94400	Feb 1920	2159.17
7	0.064	Feb 1890	25000	Feb 1920	29800	Feb 1927	67300	Mar 1941	75600	Feb 1890	2156.66
8	0.073	Dec/Jan 79	25000	Apr 1905	28900	Jan 1916	66100	Apr 1905	75000	Dec/Jan 79	2156.44
9	0.083	Mar 1905	25000	Dec/Jan 79	28400	Mar 1941	46800	Mar 1978	72900	Apr 1905	2155.63
10	0.092	Mar 1906	25000	Mar 1906	27600	Apr 1905	45500	Mar 1906	68300	Mar 1906	2152.79
11	0.102	Mar 1908	25000	Mar 1908	25800	Mar 1907	44200	Dec/Jan 79	65400	Mar 1908	2151.15
12	0.111	Apr 1917	23500	Apr 1917	24500	Mar 1906	43300	Feb 1927	65200	Apr 1917	2151
13	0.120	Mar 1983	22800	Mar 1983	23900	Mar 1918	42200	Apr 1917	59900	Mar 1983	2151
14	0.130	Mar 1985	22800	Mar 1985	23600	Apr 1917	37500	Mar 1907	55800	Mar 1985	2151
15	0.139	Mar 1907	21000	Mar 1907	21800	Mar 1937	35600	Mar 1918	39400	Mar 1907	2151
16	0.149	Dec 1983	18500	Dec 1983	19300	Dec/Jan 79	34800	Mar 1937	34300	Dec 1983	2151
17	0.158	Mar/Apr 73	18400	Mar/Apr 73	18000	Dec/Jan 66	28300	Dec 1983	33700	Mar/Apr 73	2151
18	0.168	Apr 1915	12000	Apr 1915	12600	Mar 1922	23100	Mar 1985	31600	Apr 1915	2151
19	0.177	Mar 1889	9500	Mar 1924	9500	Mar 1911	19400	Mar 1983	30300	Mar 1889	2151
20	0.187	Mar 1924	9000	Mar 1889	8400	Dec 1983	17700	Dec/Jan 66	27900	Apr 1924	2151
21	0.196	Mar 1966	6800	Mar 1966	7200	Mar 1889	17000	Mar 1908	26300	Mar 1966	2151
22	0.206	Feb/Mar 09	5800	Feb/Mar 09	6100	Mar 1983	16600	Mar/Apr 73	25900	Feb/Mar 09	2151
23	0.215	Mar 1932	4700	Mar 1932	5000	Mar/Apr 73	13300	Mar 1922	22000	Mar 1932	2151
24	0.225	Mar 1918	0	Mar 1918	0	Mar 1895	11100	Mar 1911	19400	Mar 1937	
25	0.234	Mar 1922	0	Mar 1992	0	Mar 1985	10600	Mar 1889	16900	Mar 1911	
26	0.244	Mar 1895	0	Mar 1895	0	Apr 1952	9100	Mar 1924	15200	Feb 1927	
27	0.253	Mar 1992	0	Mar 1911	0	Apr 1965*	7900	Apr 1915	15000	Mar 1992	
28	0.263	Mar 1911	0	Mar 1922	0	Mar 1924	6300	Mar 1966	12100	Mar 1895	

TABLE 5-1 (CON'T). POR SIMULATION RESULTS - WATER CONTROL PLAN P925K

RANK	MEDIAN PP	SIMULATION DATE	OUTFLOW MODIFIED ROOSEVELT (ft³/s)	SIMULATION DATE	OUTFLOW STEWART MTN (ft³/s)	SIMULATION DATE	OUTFLOW BARTLETT (ft³/s)	SIMULATION DATE	OUTFLOW GRANITE REEF (ft³/s)	SIMULATION DATE	WSE ROOSEVELT LAKE (ft, NGVD)
29	0.272	Apr 1952	0	Apr 1952	0	Mar 1966	5900	Mar 1895	11000	Mar 1918	
30	0.282	Mar 1937	0	Feb 1927	0	Mar 1992	4800	Apr 1952	9200	Dec/Jan 66	
31	0.291	Dec/Jan 66	0	Mar 1937	0	Apr 1915	4100	Apr 1965*	7900	Apr 1965*	
32	0.301	Mar 1978	0	Mar 1978	0	Feb/Mar 09	3200	Feb/Mar 09	7700	Mar 1922	
33	0.310	Feb 1927	0	Dec/Jan 66	0	Mar 1932	2100	Mar 1932	6400	Mar 1978	
34	0.320	Apr 1965*	0	Apr 1965*	0	Mar 1908	1900	Mar 1992	4800	Apr 1952	

Note:
* Spill occurred after the simulation period (Apr 18th).

TABLE 5-2. POR SIMULATION RESULTS - WATER CONTROL PLAN P9OP1

See Table 4 and Chapter III, Section C for Presentation of Water Control Plans

RANK	MEDIAN PP	SIMULATION DATE	OUTFLOW MODIFIED ROOSEVELT (ft³/s)	SIMULATION DATE	OUTFLOW STEWART MTN (ft³/s)	SIMULATION DATE	OUTFLOW BARTLETT (ft³/s)	SIMULATION DATE	OUTFLOW GRANITE REEF (ft³/s)	SIMULATION DATE	WSE ROOSEVELT LAKE (ft, NGVD)
1	0.007	Feb 1891	134000	Feb 1891	111000	Feb 1891	147000	Feb 1891	269000	Feb 1891	2175
2	0.016	Feb 1980	25000	Mar 1941	32000	Jan/Mar 93	129000	Jan/Mar 93	161000	Feb 1980	2168.28
3	0.026	Jan 1916	25000	Jan 1916	31500	Feb 1980	91100	Feb 1980	124000	Jan 1916	2166.48
4	0.035	Jan/Mar 93	25000	Feb 1980	31200	Feb 1890	82100	Feb 1890	110000	Jan/Mar 93	2164.82
5	0.045	Mar 1941	25000	Jan/Mar 93	31200	Mar 1978	80600	Feb 1920	95600	Mar 1941	2161.44
6	0.054	Feb 1920	25000	Feb 1890	30400	Feb 1920	69400	Jan 1916	94400	Feb 1920	2159.17
7	0.064	Feb 1890	25000	Feb 1920	29800	Feb 1927	67300	Mar 1941	75600	Feb 1890	2156.66
8	0.073	Dec/Jan 79	25000	Apr 1905	28900	Jan 1916	66100	Apr 1905	75000	Dec/Jan 79	2156.44
9	0.083	Apr 1905	25000	Dec/Jan 79	28400	Mar 1941	46800	Mar 1978	72900	Apr 1905	2155.63
10	0.092	Mar 1906	25000	Mar 1906	27600	Apr 1905	45500	Mar 1906	68300	Mar 1906	2152.79
11	0.102	Mar 1908	25000	Mar 1908	25800	Mar 1907	44200	Dec/Jan 79	65400	Mar 1908	2151.15
12	0.111	Apr 1917	23500	Apr 1917	24500	Mar 1906	43300	Feb 1927	65200	Apr 1917	2151
13	0.120	Mar 1985	22800	Mar 1983	23900	Mar 1918	42200	Apr 1917	59900	Mar 1985	2151
14	0.130	Mar 1983	22800	Mar 1985	23600	Apr 1917	37500	Mar 1907	55800	Mar 1983	2151
15	0.139	Mar 1907	21000	Mar 1907	21800	Mar 1937	35600	Mar 1918	39400	Mar 1907	2151
16	0.149	Dec 1983	18500	Dec 1983	19300	Dec/Jan 79	34800	Mar 1937	34300	Dec 1983	2151
17	0.158	Mar/Apr 73	18400	Mar/Apr 73	18000	Dec/Jan 66	28300	Dec 1983	33700	Mar/Apr 73	2151
18	0.168	Apr 1915	12000	Apr 1915	12600	Mar 1922	23100	Mar 1985	31600	Apr 1915	2151
19	0.177	Mar 1889	9500	Mar 1924	9500	Mar 1911	19400	Mar 1983	30300	Mar 1889	2151
20	0.187	Mar 1924	9000	Mar 1889	8400	Dec 1983	17700	Dec/Jan 66	27900	Mar 1924	2151
21	0.196	Mar 1966	6800	Mar 1966	7200	Mar 1889	17000	Mar 1908	26300	Mar 1966	2151
22	0.206	Feb/Mar 09	5800	Feb/Mar 09	6100	Mar 1983	16600	Mar/Apr 73	25900	Feb/Mar 09	2151
23	0.215	Mar 1932	4700	Mar 1932	5000	Mar/Apr 73	13300	Mar 1922	22000	Mar 1932	2151
24	0.225	Mar 1937	0	Mar 1918	0	Mar 1895	11100	Mar 1911	19400	Mar 1937	
25	0.234	Apr 1952	0	Mar 1992	0	Mar 1985	10600	Mar 1889	16900	Mar 1911	
26	0.244	Dec/Jan 66	0	Mar 1895	0	Apr 1952	9100	Mar 1924	15200	Feb 1927	
27	0.253	Feb 1927	0	Mar 1911	0	Apr 1965*	7900	Apr 1915	15000	Mar 1992	
28	0.263	Mar 1978	0	Mar 1922	0	Mar 1924	6300	Mar 1966	12100	Mar 1895	

TABLE 5-2 (CON'T). POR SIMULATION RESULTS - WATER CONTROL PLAN P9OP1

RANK	MEDIAN PP	SIMULATION DATE	OUTFLOW MODIFIED ROOSEVELT (ft^3/s)	SIMULATION DATE	OUTFLOW STEWART MTN (ft^3/s)	SIMULATION DATE	OUTFLOW BARTLETT (ft^3/s)	SIMULATION DATE	OUTFLOW GRANITE REEF (ft^3/s)	SIMULATION DATE	WSE ROOSEVELT LAKE (ft, NGVD)
29	0.272	Mar 1922	0	Apr 1952	0	Mar 1966	5900	Mar 1895	11000	Mar 1918	
30	0.282	Mar 1918	0	Feb 1927	0	Mar 1992	4700	Apr 1952	9200	Dec/Jan 66	
31	0.291	Mar 1895	0	Mar 1937	0	Apr 1915	4100	Apr 1965*	7900	Apr 1965*	
32	0.301	Mar 1911	0	Mar 1978	0	Feb/Mar 09	3200	Feb/Mar 09	7700	Mar 1922	
33	0.310	Mar 1992	0	Dec/Jan 66	0	Mar 1932	2100	Mar 1932	6400	Mar 1978	
34	*0.320*	*Apr 1965**		*Apr 1965**		Mar 1908	1900	Mar 1992	4800	Apr 1952	

Note:
* Spill occurred after the simulation period (Apr 18th).

TABLE 5-3. POR SIMULATION RESULTS - WATER CONTROL PLAN P6OP1

See Table 4 and Chapter III, Section C for Presentation of Water Control Plans

RANK	MEDIAN PP	SIMULATION DATE	OUTFLOW MODIFIED ROOSEVELT (ft^3/s)	SIMULATION DATE	OUTFLOW STEWART MTN (ft^3/s)	SIMULATION DATE	OUTFLOW BARTLETT (ft^3/s)	SIMULATION DATE	OUTFLOW GRANITE REEF (ft^3/s)	SIMULATION DATE	WSE ROOSEVELT LAKE (ft, NGVD)
1	0.007	Feb 1891	39500	Feb 1891	45700	Feb 1891	147000	Feb 1891	189000	Feb 1891	2174.95
2	0.016	Mar 1941	39300	Jan 1916	43600	Jan/Mar 93	129000	Jan/Mar 93	160000	Jan 1916	2165.53
3	0.026	Jan/Mar 93	39300	Feb 1980	42800	Feb 1980	91100	Feb 1980	130000	Feb 1980	2162.66
4	0.035	Feb 1980	39300	Jan/Mar 93	41400	Feb 1890	82100	Feb 1920	110000	Jan/Mar 93	2161.78
5	0.045	Feb 1920	39100	Mar 1941	41300	Mar 1978	80600	Jan 1916	107000	Mar 1941	2161.1
6	0.054	Jan 1916	39100	Feb 1920	41000	Feb 1920	69400	Feb 1890	97100	Feb 1920	2159.73
7	0.064	Apr 1905	37500	Apr 1905	39000	Feb 1927	67300	Mar 1941	89100	Apr 1905	2157.95
8	0.073	Feb 1890	32600	Feb 1890	33200	Jan 1916	66100	Mar 1978	72900	Feb 1890	2157.81
9	0.083	Dec/Jan 79	29600	Dec/Jan 79	30800	Mar 1941	46800	Feb 1927	65200	Dec/Jan 79	2157.65
10	0.092	Mar 1906	12200	Mar 1906	13700	Apr 1905	45500	Apr 1905	63700	Mar 1906	2155.33
11	0.102	Mar 1983	12200	Mar 1983	13400	Mar 1907	44200	Mar 1906	55500	Mar 1983	2154.03
12	0.111	Mar/Apr 73	11700	Mar/Apr 73	12500	Mar 1906	43300	Dec/Jan 79	49300	Mar/Apr 73	2152.94
13	0.120	Mar 1908	10700	Mar 1908	11100	Mar 1918	42200	Mar 1907	49000	Mar 1908	2152.79
14	0.130	Apr 1917	10100	Apr 1917	10600	Apr 1917	37500	Apr 1917	44200	Apr 1917	2152.64
15	0.139	Mar 1985	8900	Mar 1985	9100	Mar 1937	35600	Mar 1918	39400	Mar 1985	2152.42
16	0.149	Dec 1983	8100	Dec 1983	8400	Dec/Jan 79	34800	Mar 1937	34300	Dec 1983	2152.28
17	0.158	Apr 1915	7900	Apr 1915	8400	Dec/Jan 66	28300	Dec/Jan 66	27900	Apr 1915	2152.24
18	0.168	Mar 1966	6500	Mar 1907	7500	Mar 1922	23100	Dec 1983	24700	Mar 1907	2151.88
19	0.177	Mar 1907	6500	Mar 1924	7000	Mar 1911	19400	Mar 1983	24500	Mar 1889	2151.36
20	0.187	Mar 1924	6500	Mar 1966	6900	Dec 1983	17700	Mar 1922	22000	Mar 1924	2151.22
21	0.196	Mar 1889	6500	Mar 1889	6900	Mar 1889	17000	Mar/Apr 73	21400	Mar 1966	2151.01
22	0.206	Feb/Mar 09	5800	Feb/Mar 09	6100	Mar 1983	16600	Mar 1911	19400	Feb/Mar 09	2151
23	0.215	Mar 1932	4700	Mar 1932	5000	Mar/Apr 73	13300	Mar 1985	18900	Mar 1932	2151
24	0.225	Mar 1911	0	Mar 1918	0	Mar 1895	11100	Mar 1889	16900	Mar 1918	
25	0.234	Mar 1918	0	Mar 1992	0	Mar 1985	10600	Mar 1924	13300	Mar 1911	
26	0.244	Mar 1992	0	Mar 1895	0	Apr 1952	9100	Mar 1966	12100	Mar 1895	
27	0.253	Mar 1895	0	Mar 1911	0	Apr 1965*	7900	Mar 1908	11200	Mar 1992	
28	0.263	Apr 1952	0	Mar 1922	0	Mar 1924	6300	Mar 1895	11000	Mar 1922	

TABLE 5-3 (CON'T). POR SIMULATION RESULTS - WATER CONTROL PLAN P6OP1

RANK	MEDIAN PP	SIMULATION DATE	OUTFLOW MODIFIED ROOSEVELT (ft^3/s)	SIMULATION DATE	OUTFLOW STEWART MTN (ft^3/s)	SIMULATION DATE	OUTFLOW BARTLETT (ft^3/s)	SIMULATION DATE	OUTFLOW GRANITE REEF (ft^3/s)	SIMULATION DATE	WSE ROOSEVELT LAKE (ft, NGVD)
29	0.272	Feb 1927	0	Apr 1952	0	Mar 1966	5900	Apr 1915	10900	Apr 1952	
30	0.282	Mar 1937	0	Feb 1927	0	Mar 1992	4800	Apr 1952	9200	Feb 1927	
31	0.291	Apr 1965*	0	Mar 1937	0	Apr 1915	4100	Apr 1965	7900	Mar 1937	
32	0.301	Mar 1978	0	Mar 1978	0	Feb/Mar 09	3200	Feb/Mar 09	7700	Mar 1978	
33	0.310	Mar 1922	0	Dec/Jan 66	0	Mar 1932	2100	Mar 1932	6400	Dec/Jan 66	
34	0.320	Dec/Jan 66	0	Apr 1965*	0	Mar 1908	1900	Mar 1992	4800	Apr 1965*	

Note:
* Spill occurred after the simulation period (Apr 18th).

TABLE 5-4. POR SIMULATION RESULTS - WATER CONTROL PLAN P6OP2 ***RECOMMENDED PLAN***

See Table 4 and Chapter III, Section C for Presentation of Water Control Plans

RANK	MEDIAN PP	SIMULATED DATE	OUTFLOW MODIFIED ROOSEVELT (ft³/s)	SIMULATED DATE	OUTFLOW STEWART MTN (ft³/s)	SIMULATED DATE	OUTFLOW BARTLETT (ft³/s)	SIMULATED DATE	OUTFLOW GRANITE REEF (ft³/s)	SIMULATED DATE	WSE ROOSEVELT LAKE ft, NGVD
1	0.007	Feb 1891	53100	Feb 1891	55100	Feb 1891	147000	Feb 1891	199000	Feb 1891	2172.86
2	0.016	Jan 1916	39500	Feb 1980	44100	Jan/Mar 93	129000	Jan/Mar 93	160200	Jan 1916	2165.26
3	0.026	Feb 1980	39500	Mar 1941	42900	Feb 1980	91100	Feb 1980	130000	Feb 1980	2162.56
4	0.035	Jan/Mar 93	39500	Feb 1920	42200	Feb 1890	82100	Feb 1920	111000	Jan/Mar 93	2161.74
5	0.045	Feb 1920	39500	Jan/Mar 93	39500	Mar 1978	80600	Jan 1916	109000	Mar 1941	2161.01
6	0.054	Apr 1905	37500	Apr 1905	39000	Feb 1920	69400	Feb 1890	97100	Feb 1920	2159.64
7	0.064	Feb 1890	32600	Feb 1890	32200	Feb 1927	67300	Mar 1941	90100	Apr 1905	2157.95
8	0.073	Dec/Jan 79	29600	Dec/Jan 79	30800	Jan 1916	66100	Mar 1978	72900	Feb 1890	2157.81
9	0.083	Mar 1983	12200	Mar 1906	13700	Mar 1941	46800	Feb 1927	65200	Dec/Jan 79	2157.65
10	0.092	Mar 1906	12200	Mar 1983	13400	Apr 1905	45500	Apr 1905	63700	Mar 1906	2155.33
11	0.102	Mar/Apr 73	11700	Mar/Apr 73	12500	Mar 1907	44200	Mar 1906	55500	Mar 1983	2154.03
12	0.111	Mar 1908	10700	Mar 1908	11100	Mar 1906	43300	Dec/Jan 79	49300	Mar/Apr 73	2152.94
13	0.120	Apr 1917	10100	Apr 1917	10600	Mar 1918	42200	Mar 1907	49000	Mar 1908	2152.79
14	0.130	Mar 1985	8900	Mar 1985	9100	Apr 1917	37500	Apr 1917	44200	Apr 1917	2152.64
15	0.139	Dec 1983	8100	Dec 1983	8400	Mar 1937	35600	Mar 1918	39400	Mar 1985	2152.42
16	0.149	Apr 1915	7900	Apr 1915	8400	Dec/Jan 79	34800	Mar 1937	34300	Dec 1983	2152.28
17	0.158	Mar 1966	6500	Mar 1907	7500	Dec/Jan 66	28300	Dec/Jan 66	27900	Apr 1915	2152.24
18	0.168	Mar 1924	6500	Mar 1924	7000	Mar 1922	23100	Dec 1983	24700	Mar 1907	2151.88
19	0.177	Mar 1907	6500	Mar 1889	6900	Mar 1911	19400	Mar 1983	24500	Mar 1889	2151.36
20	0.187	Mar 1889	6500	Mar 1966	6900	Dec 1983	17700	Mar 1922	22000	Mar 1924	2151.22
21	0.196	Feb/Mar 09	5800	Feb/Mar 09	6100	Mar 1889	17000	Mar/Apr 73	21400	Mar 1966	2151
22	0.206	Mar 1932	4700	Mar 1932	5000	Mar 1983	16600	Mar 1911	19400	Feb/Mar 09	2151
23	0.215	Mar 1941	3950	Jan 1916	4600	Mar/Apr 73	13300	Mar 1985	18900	Mar 1932	2151
24	0.225	Mar 1918	0	Mar 1918	0	Mar 1895	11100	Mar 1889	16900	Mar 1918	
25	0.234	Mar 1911	0	Mar 1992	0	Mar 1985	10600	Mar 1924	13300	Mar 1922	

TABLE 5-4 (CON'T). POR SIMULATION RESULTS - WATER CONTROL PLAN P6OP2 ***RECOMMENDED PLAN***

RANK	MEDIAN PP	SIMULATED DATE	OUTFLOW MODIFIED ROOSEVELT (ft³/s)	SIMULATED DATE	OUTFLOW STEWART MTN (ft³/s)	SIMULATED DATE	OUTFLOW BARTLETT (ft³/s)	SIMULATED DATE	OUTFLOW GRANITE REEF (ft³/s)	SIMULATED DATE	WSE ROOSEVELT LAKE ft, NGVD
26	0.244	Mar 1992	0	Mar 1895	0	Apr 1952	9100	Mar 1966	12100	Mar 1895	
27	0.253	Mar 1895	0	Mar 1911	0	Apr 1965*	7900	Mar 1908	11200	Mar 1992	
28	0.263	Feb 1927	0	Feb 1927	0	Mar 1924	6300	Mar 1895	11000	Mar 1911	
29	0.272	Apr 1952	0	Apr 1952	0	Mar 1966	5900	Apr 1915	10900	Apr 1965*	
30	0.282	Mar 1937	0	Mar 1937	0	Mar 1992	4700	Apr 1952	9200	Apr 1952	
31	0.291	Mar 1978	0	Mar 1978	0	Apr 1915	4100	Apr 1965*	7900	Mar 1937	
32	0.301	Mar 1922	0	Mar 1922	0	Feb/Mar 09	3200	Feb/Mar 09	7700	Mar 1978	
33	0.310	Dec/Jan 66	0	Dec/Jan 66	0	Mar 1932	2100	Mar 1932	6400	Feb 1927	
34	0.320	Apr 1965*		Apr 1965*		Mar 1908	1900	Mar 1992	4800	Dec/Jan 66	

Note:
* Spill occurred after the simulated period (Apr 18th).

TABLE 6. STARTING STORAGE FOR SRP DAMS - SYNTHETIC FLOOD SIMULATIONS

SRP DAM REFERENCE NUMBER[a]	FREQUENCY OF SYNTHETIC FLOOD, YEARS							
	2	5	10	20	50	100	200	500
	All Storages in Ac-ft							
1	769,168	769,168	1,009,168	1,009,168	1,209,168	1,349,168	1,449,168	1,549,168
2	220,138	220,138	220,138	220,138	220,138	220,138	220,138	220,138
3	52,052	52,052	52,052	52,052	52,052	52,052	52,052	52,052
4	62,675	62,675	62,675	62,675	62,675	62,675	62,675	62,675
5	0	0	41,427	41,427	41,427	131,427[F]	131,427[F]	131,427[F]
6	0	o	88,186	88,186	88,186	178,186[F]	178,186[F]	178,186[F]

Note: [a] SRP DAM reference numbers defined as follows

- 1=Modified Roosevelt
- 2=Horse Mesa
- 3=Mormon Flat
- 4=Stewart Mountain
- 5=Horseshoe
- 6=Bartlett

[F] Indicates that for this synthetic flood simulation the reservoir is full

TABLE 7. CHANNEL CAPACITIES FOR SALT RIVER AND GILA RIVER (FROM GILLESPIE DAM TO GRANITE REEF DAM)

Channel Capacity Reach (miles above the Colorado-Gila River Confluence)	Limiting Channel Capacity (cfs)	First Breakout Location Station	
		Left Bank	Right Bank
Gillespie Dam			
166.60 - 167.52	10,000	167.52	
167.52 - 168.20	10,000		167.62
168.20 - 168.63	6,000		168.63
168.63 - 169.80	30,000	169.07	
169.80 - 169.89	5,000	169.84	
169.89 - 173.28	10,000		172.79
173.28 - 173.65	5,000	173.37	
173.65 - 175.17	12,000	174.47	
175.17 - 175.45	6,000		175.25
175.45 - 176.30	20,000		175.53
176.30 - 178.55	8,000		177.58
178.55 - 179.11	50,000	178.77	178.77
179.11 - 179.34	6,000		179.20
179.34 - 180.02	20,000		179.91
HWY 85 Bridge	245,000		
180.02 - 180.06	20,000		180.05
180.06 - 180.29	20,000		180.18
180.29 - 181.72	50,000	180.94	
181.72 - 182.20	30,000		181.99
182.20 - 182.83	50,000		182.56
182.83 - 183.02	30,000		182.92
183.02 - 183.18	80,000		183.11
183.18 - 183.32	90,000		183.31
183.32 - 183.45	80,000		183.39
183.45 - 185.19	130,000		185.00
185.19 - 185.85	90,000		185.71
185.85 - 186.26	70,000		186.00
186.26 - 187.30	90,000		186.55
187.30 - 188.06	70,000	187.45	
Tuthill Bridge	200,000		
188.06 - 189.05	180,000		188.81
189.05 - 189.39	50,000		189.12
189.39 - 190.00	30,000		189.68
190.00 - 191.16	70,000	190.40	
191.16 - 191.67	50,000	191.36	
191.67 - 192.64	30,000		191.94
192.64 - 192.73	90,000		192.69
192.73 - 193.46	130,000		192.97
193.46 - 193.58	90,000	193.54	
193.58 - 194.20	200,000		193.86
Estrella Pkwy Bridge	220,000		
194.20 - 194.61	130,000	194.30	

Table 7. continued...

Channel Capacity Reach (miles above the Colorado-Gila River Confluence)	Limiting Channel Capacity (cfs)	First Breakout Location Station	
		Left Bank	Right Bank
194.61 - 195.15	180,000		194.81
Bullard Rd Bridge	220,000		
195.15 - 195.75	90,000		195.38
195.75 - 196.08	50,000		195.94
196.08 - 196.53	90,000		196.32
196.53 - 198.13	70,000	197.54	
198.13 - 198.26	90,000	197.54	
El Mirage Rd Dip Crossing	5,000		
198.26 - 199.30	90,000	199.30	
115th Ave Dip Crossing	5,000		
199.30 - 199.35	90,000	199.30	
199.35 - 199.61	180,000		199.61
199.61 - 200.10	25,000	199.72	
200.10 - 201.14	80,000		200.20
201.14 - 202.18	100,000		201.43
202.18 - 202.29	50,000	202.29	
91st Ave Dip Crossing	5,000		
202.29 - 202.33	50,000	202.29	
202.33 - 202.77	170,000	202.59	
202.77 - 203.70	100,000	202.90	
203.70 - 204.42	200,000	204.25	
204.42 - 204.60	100,000	204.53	
204.60 - 205.90	30,000	204.97	
67th Ave Dip Crossing	5,000		
205.90 - 205.95	30,000	204.97	
205.95 - 206.32	100,000		206.03
206.32 - 206.67	50,000	206.60	
206.67 - 207.07	130,000	207.07	
207.07 - 207.30	50,000		207.27
207.30 - 207.48	130,000		207.32
51st Avenue Bridge	200,000		
207.48 - 207.52	130,000	207.48	207.48
207.52 - 207.63	50,000	207.53	
207.63 - 207.90	130,000	207.63	
207.90 - 208.72	170,000		208.19
208.82 - 209.55	50,000		208.96
35th Avenue Bridge	105,000		
209.55 - 210.26	50,000	210.17	
210.26 - 210.39	170,000		210.26
210.39 - 210.52	170,000		210.46
210.52 - 210.59	100,000		210.57
210.59 - 210.71	80,000	210.64	
210.71 - 211.06	130,000		210.95
211.06 - 211.45	200,000	211.41	
211.45 - 211.54	170,000	211.52	
19th Avenue Bridge	180,000		
211.54 - 211.65	170,000		211.63

Table 7. continued...

Channel Capacity Reach (miles above the Colorado-Gila River Confluence)	Limiting Channel Capacity (cfs)	First Breakout Location Station	
		Left Bank	Right Bank
211.65 - 211.95	50,000		211.71
211.95 - 212.15	100,000		212.08
212.15 - 212.67	200,000	212.18	
7th Avenue Bridge	200,000		
212.67 - 212.97	200,000		212.67
212.97 - 213.26	170,000		213.22
Central Avenue Bridge	180,000		
213.26 - 213.29	170,000		213.28
213.29 - 213.48	130,000	213.34	
213.48 - 213.74	170,000	213.48	
7th Avenue Bridge	200,000		
213.74 - 213.78	170,000	213.74	
213.78 - 213.91	130,000	213.86	
213.91 - 214.14	170,000	214.05	
214.14 - 214.78	200,000	214.23	
16th Street Bridge	180,000		
214.78 - 215.18	200,000	215.18	
215.18 - 215.36	125,000	215.27	
215.36 - 215.82	200,000	215.57	215.57
24th Street Bridge	180,000		
215.82 - 216.12	200,000		
216.12 - 216.50	150,000	216.23	
Freeway 10 Bridge	215,000		
216.50 - 216.87	150,000		216.62
216.87 - 216.95	300,000		216.92
216.95 - 217.48	300,000		217.48
217.48 - 219.02	260,000	Channel Modified	
Hohokam Expwy Bridge	289,000		
219.02 -220.05	260,000	Channel Modified	
Priest Drive Bridge	289,000		
220.05 - 221.06	260,000	Channel Modified	
Southern Pac. R.Road Bridge	250,000		
221.06 - 221.26	260,000	Channel Modified	
Mill Avenue	250,000		
221.26 - 222.09	260,000	Channel Modified	
Rural Road Bridge	250,000		
222.09 - 223.10	260,000	Channel Modified	
McClintock Drive Bridge	250,000		
223.10 - 224.15	260,000	Channel Modified	
224.15 - 224.57	50,000		224.24
224.57 - 224.80	150,000		224.71
224.80 - 225.22	100,000	225.10	
225.22 - 225.28	150,000	225.28	
225.28 - 226.50	260,000	226.23	
Alma School Road Bridge	190,000		
226.50 - 226.99	260,000	226.89	
McKellips Rd Dip Crossing	5,000		

Table 7. continued...

Channel Capacity Reach (miles above the Colorado-Gila River Confluence)	Limiting Channel Capacity (cfs)	First Breakout Location Station	
		Left Bank	Right Bank
226.99 - 227.38		226.89	
227.38 - 227.61	40,000	227.56	
Country Club Road Bridge	180,000		
227.61 - 228.11	40,000		227.87
228.11 - 228.20	10,000	228.17	
228.20 - 228.63	260,000		228.63
228.63 - 229.34	40,000	229.30	
229.34 - 229.91	180,000		229.68
229.91 - 230.10	20,000		230.09
230.10 - 230.84	40,000		230.47
230.84 - 231.60	120,000	231.41	
Gilbert Road Bridge	70,000		
231.60 - 232.03	120,000		231.88
232.03 - 232.97	40,000		232.36
232.97 - 233.44	80,000		233.41
233.87 - 234.76	180,000		233.95
234.76 - 235.07	80,000	234.91	
235.07 - 235.68	40,000	235.57	
235.68 - 236.04	80,000		235.76
236.04 - 236.77	180,000	236.53	
236.77 - 237.50	60,000	237.00	
Granite Reef Dam			

Note: Breakouts do not necessarily cause damage to areas within the adjacent flood plain.

TABLE 8. MODIFIED PULS ROUTING (DT = 1 HOUR)
SALT RIVER PROJECT SYSTEM

DISCHARGE (FT^3/S)	STORAGE (AC-FT) IN CHANNEL REACHES		
	STEWART MTN TO GRANITE REEF	HORSESHOE TO BARTLETT	BARTLETT TO GRANITE REEF
0	0	0	0
1000	405	845	1210
5000	1350	2800	3540
10,000	2270	4600	5700
20,000	3850	7700	9780
30,000	5240	9930	13,000
40,000	6550	12,400	16,300
50,000	7860	14,000	18,900
60,000	9020	16,000	22,200
70,000	10,190	17,700	24,800
80,000	11,200	19,400	27,700
90,000	12,400	20,900	30,300
100,000	13,500	22,400	32,600
150,000	18,900	28,600	45,700
200,000	23,300	33,800	58,700
300,000	38,600	50,700	105,700
400,000	68,500	73,000	172,000

TABLE 9-1. SIMULATED POR DISCHARGES AT GRANITE REEF DAM RECOMMENDED PLAN (P6OP2)

DISCHARGE IN FT^3/S

DATE	PEAK	RANK	1-DAY	RANK	2-DAY	RANK	3-DAY	RANK	5-DAY	RANK	10-DAY	RANK	ORDER	PP
Mar 1889	16430	24	14561	24	12280	24	10971	25	9622	22	5788	29	1	0.007
Feb 1890	82183	7	74089	7	57711	7	43969	9	27799	11	13915	12	2	0.016
Feb 1891	198513	1	185241	1	159870	1	134312	1	102182	1	86324	1	3	0.026
Mar 1895	10966	28	10065	28	8326	29	7207	29	6047	31	5103	31	4	0.035
Apr 1905	63535	10	62499	9	57370	8	50390	7	36633	7	18619	9	5	0.045
Mar 1906	55330	11	47948	11	37637	12	31640	12	20969	12	10515	16	6	0.054
Mar 1907	42102	13	30736	15	22909	15	19815	15	16180	16	9948	17	7	0.064
Mar 1908	11266	27	9753	29	9020	28	8778	28	8351	27	5949	28	8	0.073
Feb 1909	7671	31	7231	31	6897	31	6715	31	6243	29	5979	27	9	0.083
Mar 1911	19425	22	17257	22	13487	23	11584	23	8505	26	7783	23	10	0.092
Apr 1915	10932	29	10662	27	10102	27	9535	27	9232	23	9106	19	11	0.102
Jan 1916	108978	5	99948	4	92201	4	83862	2	68369	4	35643	4	12	0.111
Apr 1917	36305	15	31421	14	25209	13	23095	13	16429	15	8677	22	13	0.120
Mar 1918	39430	14	32643	13	23449	14	18670	17	14877	18	12258	14	14	0.130
Feb 1920	110716	4	99620	5	85387	5	74113	5	56182	5	31668	5	15	0.139
Mar 1922	21960	20	18407	21	14671	22	12311	22	8612	25	4331	32	16	0.149
Apr 1924	12989	25	11997	25	10826	26	10226	26	8955	24	7283	24	17	0.158
Feb 1927	65197	9	57675	10	49709	10	44450	8	33482	8	17966	10	18	0.168
Mar 1932	6320	32	6219	32	6017	32	5891	32	5651	32	5399	30	19	0.177
Mar 1937	34252	16	27200	16	21619	17	17627	19	13156	19	8782	21	20	0.187
Mar 1941	91101	6	78627	6	69740	6	63205	6	43288	6	21721	7	21	0.196
Apr 1952	9224	30	9013	30	7789	30	6989	30	6168	30	6385*	26	22	0.206
Apr 1965	596	34	524	34	415	34	352	34	284	34	146	34	23	0.215
Dec 1965	27889	17	27107	17	17526	20	12425	21	7538	28	6754**	25	24	0.225
Mar 1966	11934	26	11451	26	11213	25	11011	24	10452	21	8890	20	25	0.234
Apr 1973	21376	21	20824	20	19946	19	19161	16	17921	13	16245	11	26	0.244
Mar 1978	72901	8	63745	8	54003	9	42056	10	32146	9	18878	8	27	0.253
Jan 1979	49344	12	41571	12	40382	11	37554	11	29754	10	21919	6	28	0.263
Feb 1980	129933	3	114451	3	93295	3	82067	4	76223	2	69519	2	29	0.272
Mar 1983	24334	19	23454	18	21709	16	20129	14	17748	14	13296	13	30	0.282
Dec 1983	24686	18	23223	19	20877	18	18651	18	15069	17	9225***	18	31	0.291
Mar 1985	18946	23	16805	23	15467	21	14092	20	12733	20	12024	15	32	0.301
Mar 1992	5545	33	5223	33	4934	33	4520	33	3837	33	2984	33	33	0.310
Jan 1993	160451	2	124462	2	97985	2	83806	3	70881	3	54883	3	34	0.320

* Hydrograph for the period April 1952 only shows half cycle of the entire hydrograph. The period of March 1952 was assumed to be symmetrical with that of April to complete the cycle.

** Periods Dec 1965 and Jan 1966 were merged to obtain the 10-day duration.

*** Hydrograph for this period was extrapolated up to Jan 1984 (Ref. USGS Water Resources Data. AZ 1984)

TABLE 9-2. SIMULATED POR DISCHARGES AT GILA RIVER CONFLUENCE RECOMMENDED PLAN (P6OP2)

DISCHARGE IN FT³/S

DATE	PEAK	RANK	1-DAY	RANK	2-DAY	RANK	3-DAY	RANK	5-DAY	RANK	10-DAY	RANK	ORDER	PP
Mar 1889	14497	24	13613	24	11947	24	10694	22	9991	22	5664	27	1	0.007
Feb 1890	78658	6	73088	6	59560	7	47124	8	29757	10	14890	12	2	0.016
Feb 1891	190090	1	178255	1	155060	1	131818	1	101259	1	85493	1	3	0.026
Mar 1895	9309	28	8692	28	7390	29	6393	30	5282	31	4345	31	4	0.035
Apr 1905	60542	9	59176	8	54700	8	49099	7	37115	7	19463	8	5	0.045
Mar 1906	48315	11	43725	11	37089	12	32087	12	23116	12	11696	14	6	0.054
Mar 1907	38503	14	33750	14	27392	14	22932	14	18073	14	11150	17	7	0.064
Mar 1908	7524	30	7480	30	7384	30	7203	28	7121	27	5244	28	8	0.073
Feb 1909	6473	31	6281	31	6071	31	5908	31	5477	29	5208	29	9	0.083
Mar 1911	16397	22	15020	23	12265	23	10552	23	7675	25	7013	23	10	0.092
Apr 1915	9924	27	9714	27	9243	27	8895	27	8556	24	8367	21	11	0.102
Jan 1916	100764	4	96146	4	89350	4	81567	2	66833	4	35713	4	12	0.111
Apr 1917	39314	13	36841	13	32837	13	29142	13	20069	13	10667	18	13	0.120
Mar 1918	32105	15	28493	15	21943	15	17639	17	13765	18	11581	15	14	0.130
Feb 1920	97978	5	92885	5	83278	5	74121	5	58557	5	33410	5	15	0.139
Mar 1922	18060	21	16062	21	13421	21	11354	21	7515	26	3764	32	16	0.149
Apr 1924	11814	25	11413	25	10639	25	9957	25	8733	23	6999	24	17	0.158
Feb 1927	58486	10	54350	10	47994	10	42617	9	32467	8	17205	10	18	0.168
Mar 1932	5450	32	5363	32	5226	32	5119	32	4899	32	4706	30	19	0.177
Mar 1937	27043	16	24097	16	20081	17	16652	19	12293	19	8039	22	20	0.187
Mar 1941	75734	7	72948	7	66786	6	61134	6	43903	6	22150	6	21	0.196
Apr 1952	8421	29	8352	29	7512	28	6650	29	5700	28	5915*	26	22	0.206
Dec 1965	25659	17	21749	18	12869	22	8904	26	5346	30	5996**	25	23	0.215
Mar 1966	10947	26	10842	26	10632	26	10474	24	9995	21	8561	20	24	0.225
Apr 1973	19952	20	19630	20	18943	19	18236	16	17085	15	15445	11	25	0.234
Mar 1978	62314	8	57916	9	50060	9	40210	10	30734	9	18116	9	26	0.244
Jan 1979	41444	12	39525	12	37978	11	35819	11	28820	11	21103	7	27	0.253
Feb 1980	113094	3	104779	3	90564	3	80575	4	73930	2	68566	2	28	0.263
Mar 1983	22455	18	21833	17	20547	16	19251	15	16967	16	12938	13	29	0.272
Dec 1983	22326	19	21368	19	19534	18	17541	18	14146	17	8741***	19	30	0.282
Mar 1985	15800	23	15072	22	14282	20	13199	20	11879	20	11251	16	31	0.291
Mar 1992	3716	33	3627	33	3390	33	3113	33	2597	33	2038	33	32	0.301
Jan 1993	122443	2	110052	2	92908	2	80868	3	68662	3	52981	3	33	0.310

* Hydrograph for the period April 1952 only shows half cycle of the entire hydrograph.
The period of March 1952 was assumed to be symmetrical with that of April to complete the cycle.

** Periods Dec 1965 and Jan 1966 were merged to obtain the 10-day duration.

*** Hydrograph for this period was extrapolated up to Jan 1984 *(Ref. USGS Water Resources Data. AZ 1984)*

TABLE 9-3. SIMULATED POR DISCHARGES BELOW GILA RIVER CONFLUENCE RECOMMENDED PLAN (P6OP2) - COMPARISON: w/ vs. w/o Project

DISCHARGE IN FT^3/S

DATE[a]	PEAK W/PROJECT	RANK	PP	PEAK W/O PROJECT[b]
Mar 1889	14,500	28	.263	32,300
Feb 1890	78,700	7	.064	122,900
Feb 1891	235,000	1	.007	300,000
Mar 1895	9300	34	.320	3800
Apr 1905	60,500	10	.092	103,800
Nov 1905	50,000[1,2]			160,000
Mar 1906	48,300	12	.111	
Mar 1907	38,500	15	.139	41,400
Feb 1908	7520	36	.339	30,600
Dec 1908	[1]			78,000
Feb 1909	6470	37	.348	NA
Mar 1911	16,400	25	.234	NA
Feb 1914	[1]			16,300
Jan 1915	[1]			22,200
Apr 1915	9920	33	.310	NA
Jan 1916	121,000	4	.035	150,000
Apr 1917	39,300	14	.130	47,300
Mar 1918	32,100	17	.158	28,500
Feb 1920	98,000	5	.045	126,300
Aug 1921	15,500[1,2]	27	.253	15,500
Mar 1922	18,100	24	.225	24,700
Sep 1923	1800[1,2]	53	.500	1800
Dec 1923	[1]			75,500
Apr 1924	11,800	29	.272	NA
Sep 1925	3600[1,2]	47	.443	3600
Sep 1926	36,600[1,2]	16	.149	36,600

TABLE 9-3. SIMULATED POR DISCHARGES BELOW GILA RIVER CONFLUENCE RECOMMENDED PLAN (P6OP2) - COMPARISON: w/ vs. w/o Project (continued)

DISCHARGE IN FT^3/S

DATE[a]	PEAK W/PROJECT	RANK	PP	PEAK W/O PROJECT[b]
Feb 1927	58,500	11	.102	74,400
Aug 1928	5400[1,2]	41	.386	5400
Sep 1929	5400[1,2]	40	.377	5400
Aug 1930	18,400[1,2]	23	.215	18,400
Aug 1931	6400[1,2]	38	.358	6400
Feb 1932	NA			81,000
Mar 1932	5450	39	.367	NA
Oct 1932	300[1,2]	65	.614	300
Aug 1934	1400[1,2]	55	.519	1400
Aug 1935	4800[1,2]	44	.415	4800
Jul 1936	2600[1,2]	48	.453	2600
Mar 1937	27,000	18	.168	43,100
Mar 1938	[1]			59,000
Sep 1939	900[1,2]	58	.547	900
Aug 1940	11,100[1,2]	30	.282	11,100
Mar 1941	75,700	8	.073	117,000
Apr 1942	[1]			3500
Aug 1943	1900[1,2]	52	.491	1900
Aug 1945	5200[1,2]	42	.396	5200
Sep 1946	500[1,2]	60	.566	500
Aug 1947	2600[1,2]	49	.462	2600
Oct 1949	200[1,2]	69	.652	200
Aug 1951	2000[1,2]	51	.481	2000
Apr 1952	8420	35	.329	6500
Aug 1954	800[1,2]	59	.557	800
Aug 1955	2300[1,2]	50	.472	2300

TABLE 9-3. SIMULATED POR DISCHARGES BELOW GILA RIVER CONFLUENCE RECOMMENDED PLAN (P6OP2) - COMPARISON: w/ vs. w/o Project (continued)

DISCHARGE IN FT^3/S

DATE[a]	PEAK W/PROJECT	RANK	PP	PEAK W/O PROJECT[b]
Apr 1965	4100			5200
Dec 1965	25,700	19	.177	40,800
Mar 1966	10,900	32	.301	NA
Dec 1967	[1]			20,600
Mar 1968	[1]			11,500
Apr 1969	[1]			3700
Sep 1970	1200[1,2]	56	.528	1200
Aug 1971	200[1,2]	68	.642	200
Mar 1973	NA			21,100
Apr 1973	20,000	22	.206	NA
Sep 1976	400[1,2]	61	.576	400
Mar 1978	62,300	9	.083	93,900
Dec 1978	NA			136,000
Jan 1979	41,400	13	.120	NA
Feb 1980	130,000	3	.026	194,000
Sep 1981	217[1,2]	67	.633	217
Sep 1982	143[1,2]	70	.661	143
Mar 1983	22,500	20	.187	NA
Oct 1983	95,200[1,2]	6	.054	95,200
Sep 1984	3930[1,2]	45	.424	3930
Mar 1985	15,800	26	.244	NA
Jul 1986	346	63	.595	NA
Jul 1987	346	64	.604	346
Sep 1988	1135[1,2]	57	.538	1135
Oct 1989	370[1,2]	62	.585	370
Aug 1990	1438[1,2]	54	.509	1438

TABLE 9-3. SIMULATED POR DISCHARGES BELOW GILA RIVER CONFLUENCE RECOMMENDED PLAN (P6OP2) - COMPARISON: w/ vs. w/o Project (continued)

DISCHARGE IN FT^3/S

DATE[a]	PEAK W/PROJECT	RANK	PP	PEAK W/O PROJECT[b]
Sep 1991	270[1,2]	66	.623	270
Mar 1992	3720	46	.434	NA
Aug 1992	11,100[1,2]	31	.291	11,100
Jan 1993	150,000	2	.016	NA

[a] W/O Project Discharges for the Salt River above the Gila River unavailable after 1980, since no analysis of data post-1982 CAWCS Hydrology Report was done.
[b] Source: Table 3-6 of 1982 CAWCS Hydrology Report
[1] No "spill" w/ project
[2] Discharge resulted from tributary inflow to the Gila from source other than Salt River. Estimated based upon recorded discharges for the Gila River at Gillespie Dam.
NA = Not Applicable

TABLE 10. COMPARISON OF SIGNIFICANT FLOODS OF RECORD SIMULATED W/ AND W/O PROJECT AND NATURAL RUNOFF[1] PEAK DISCHARGE IN SALT RIVER AT GRANITE REEF DIVERSION DAM

WATER YEAR	MONTH	W/O PROJECT[2]	W/ PROJECT (P6OP2)	NATURAL[2]
1891	February	271,000	199,000	300,000
1905	April	113,000	63,500	115,000
1906	November	134,000	*no spill*	220,000
1916	January	145,000	109,000	164,000
1920	February	138,000	111,000	155,000
1927	February	82,000	65,200	123,000
1932	February	86,000	*no spill*[a]	117,000
1938	March	77,000	*no spill*	115,000
1941	March	132,000	91,100	170,000
1966	December	47,000	27,900	85,000
1978	March	119,000	72,900	260,000
1979	December	157,000	49,300	235,000
1980	February	201,000	130,000	241,000

Notes:

[1] Natural flow is the peak discharge which would have occurred in the absence of SRP reservoirs.

[2] Results based on simulations reported in Table 4 of the May 1982 CAWCS Hydrology Report for the period from 1889 through 1980 only. W/O project unavailable for the period since 1980.

[a] Spill occurred in the following month, but was only 6300 ft^3/s.

TABLE 11. MODIFIED PULS ROUTING (DT = 6-HOUR)
LOWER SALT RIVER (BELOW VERDE RIVER CONFLUENCE) TO GILLESPIE DAM

DISCHARGE (FT^3/S)		STORAGE (AC-FT) AND PERCOLATION LOSS (FT^3/S) IN CHANNEL REACHES			
		GRANITE REEF DAM TO GILA RIVER CONFLUENCE	GILA RIVER CONFLUENCE TO WATERMAN WASH	WATERMAN WASH TO HASSAYAMPA RIVER	HASSAYAMPA RIVER TO GILLESPIE DAM
0	Storage Percolation	0 750	0 660	0 830	0 330
50,000	Storage Percolation	34,000 750	38,000 660	42,300 830	8750 330
100,000	Storage Percolation	64,700 750	62,000 860	65,000 1180	14200 400
150,000	Storage Percolation	90,700 870	84,900 1060	86,900 1550	19,400 475
200,000	Storage Percolation	113,400 970	104,000 1200	106,000 1750	23,800 530
250,000	Storage Percolation	138,600 1140	122,000 1330	122,000 1880	28,100 570
300,000	Storage Percolation	162,500 1310	141,000 1440	137,000 2000	32,500 630
320,000	Storage Percolation	172,000 1340	148,000 1490	144,000 2050	34,200 650

TABLE 12. POR ELEVATION FREQUENCY DATA
SRPSIM RESULTS, 1889-1993

Year	Elevation
1889	2151
1890	2151
1891	2151
1892	2132
1893	2102
1894	2087
1895	2104
1896	2098.5
1897	2116.5
1898	2105
1899	2077
1900	2055
1901	2055.1
1902	2035
1903	2030
1904	2023
1905	2151
1906	2151
1907	2151
1908	2151
1909	2151
1910	2144.5
1911	2143.5
1912	2136
1913	2125
1914	2114.5
1915	2151
1916	2151
1917	2151
1918	2138
1919	2139
1920	2151
1921	2134
1922	2147
1923	2140.5
1924	2151
1925	2128
1926	2127.5
1927	2148
1928	2134
1929	2117
1930	2113.5
1931	2113
1932	2151
1933	2136
1934	2113.5
1935	2117
1936	2129
1937	2151
1938	2133
1939	2117.5
1940	2096
1941	2151

Plotting positions for events ranked 1-23 determined from short time-interval simulation. See Tables 5-1 through 5-4 for results.

Rank	Year	Elevation	PP
1	1924	2151	
2	1920	2151	
3	1907	2151	
4	1932	2151	
5	1917	2151	
6	1909	2151	
7	1908	2151	
8	1916	2151	
9	1915	2151	
10	1941	2151	
11	1985	2151	
12	1984	2151	
13	1993	2151	
14	1906	2151	
15	1983	2151	
16	1973	2151	
17	1966	2151	
18	1980	2151	
19	1979	2151	
20	1889	2151	
21	1890	2151	
22	1905	2151	
23	1891	2151	
24	1937	2151	0.225
25	1992	2151	0.234
26	1968	2150	0.244
27	1927	2148	0.253
28	1987	2147.5	0.263
29	1922	2147	0.272
30	1952	2145	0.282
31	1910	2144.5	0.291
32	1942	2144	0.301
33	1911	2143.5	0.310
34	1991	2141	0.320
35	1986	2141	0.329
36	1923	2140.5	0.339
37	1969	2140	0.348
38	1919	2139	0.358
39	1988	2138.5	0.367
40	1943	2138	0.377
41	1982	2138	0.386
42	1918	2138	0.396
43	1912	2136	0.405
44	1933	2136	0.415
45	1921	2134	0.424
46	1928	2134	0.434
47	1989	2134	0.443
48	1981	2134	0.453
49	1974	2133.5	0.462
50	1967	2133.1	0.472
51	1960	2133.1	0.481
52	1938	2133	0.491
53	1892	2132	0.500

TABLE 12 (cont). POR ELEVATION FREQUENCY DATA
SRPSIM RESULTS, 1889-1993

Year	Elevation
1942	2144
1943	2138
1944	2119
1945	2116.8
1946	2099
1947	2094
1948	2086
1949	2109
1950	2102
1951	2070
1952	2145
1953	2128
1954	2095
1955	2073
1956	2068
1957	2064
1958	2102.2
1959	2096
1960	2133.1
1961	2109.5
1962	2118
1963	2094
1964	2079
1965	2114
1966	2151
1967	2133.1
1968	2150
1969	2140
1970	2125
1971	2101
1972	2099
1973	2151
1974	2133.5
1975	2117
1976	2103
1977	2084
1978	2050.5
1979	2151
1980	2151
1981	2134
1982	2138
1983	2151
1984	2151
1985	2151
1986	2141
1987	2147.5
1988	2138.5
1989	2134
1990	2096
1991	2141
1992	2151
1993	2151

Rank	Year	Elevation	PP
54	1936	2129	0.509
55	1953	2128	0.519
56	1925	2128	0.528
57	1926	2127.5	0.538
58	1913	2125	0.547
59	1970	2125	0.557
60	1944	2119	0.566
61	1962	2118	0.576
62	1939	2117.5	0.585
63	1975	2117	0.595
64	1929	2117	0.604
65	1935	2117	0.614
66	1945	2116.8	0.623
67	1897	2116.5	0.633
68	1914	2114.5	0.642
69	1965	2114	0.652
70	1934	2113.5	0.661
71	1930	2113.5	0.671
72	1931	2113	0.680
73	1961	2109.5	0.690
74	1949	2109	0.699
75	1898	2105	0.709
76	1895	2104	0.718
77	1976	2103	0.728
78	1958	2102.2	0.737
79	1893	2102	0.747
80	1950	2102	0.756
81	1971	2101	0.766
82	1972	2099	0.775
83	1946	2099	0.785
84	1896	2098.5	0.794
85	1990	2096	0.804
86	1940	2096	0.813
87	1959	2096	0.823
88	1954	2095	0.832
89	1963	2094	0.842
90	1947	2094	0.851
91	1894	2087	0.861
92	1948	2086	0.870
93	1977	2084	0.880
94	1964	2079	0.889
95	1899	2077	0.898
96	1955	2073	0.908
97	1951	2070	0.917
98	1956	2068	0.927
99	1957	2064	0.936
100	1901	2055.1	0.946
101	1900	2055	0.955
102	1978	2050.5	0.965
103	1902	2035	0.974
104	1903	2030	0.984
105	1904	2023	0.993

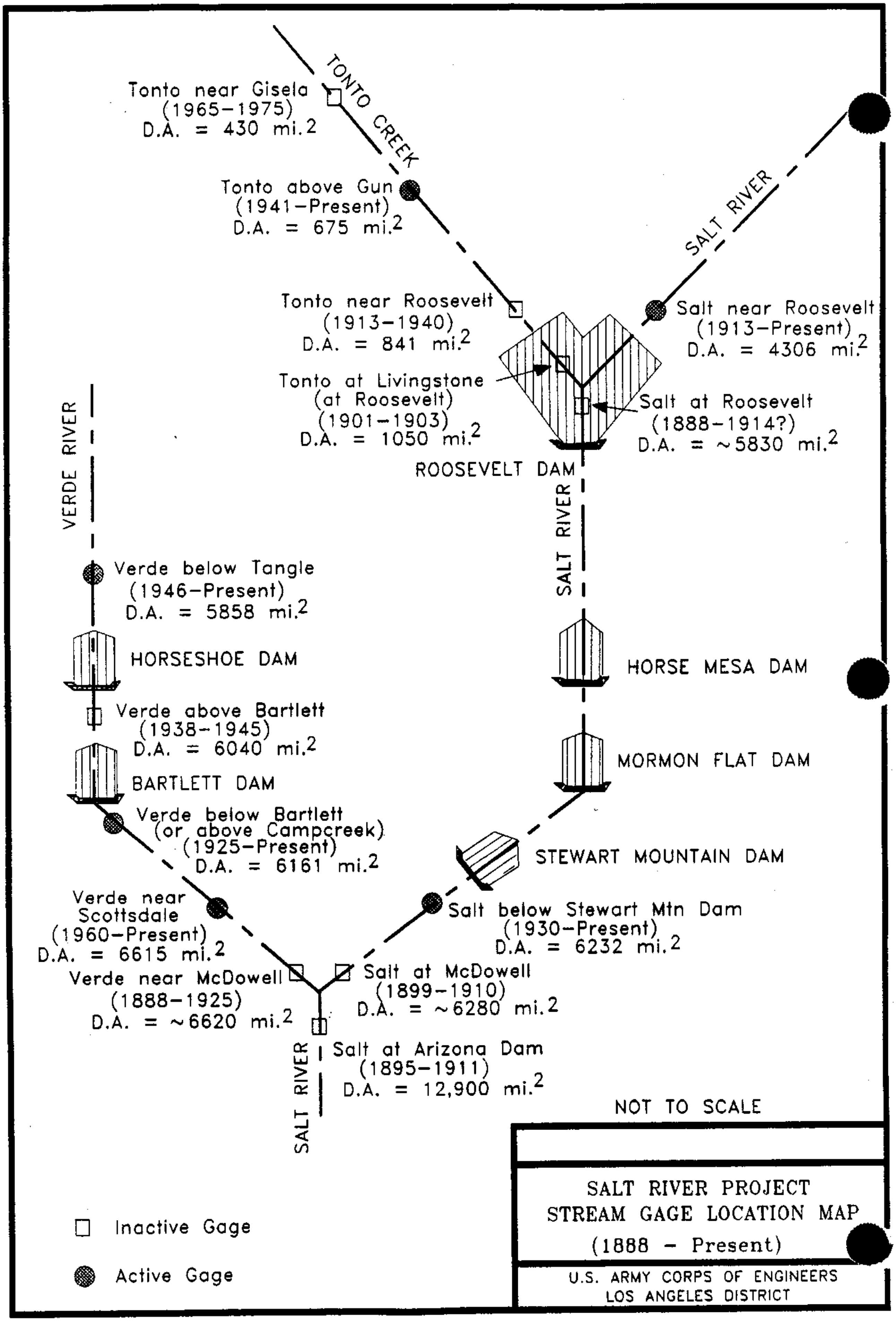

TONTO CREEK
Tonto near Gisela
(1965–1975)
D.A. = 430 mi.2
Tonto above Gun
(1941–Present)
D.A. = 675 mi.2
SALT RIVER
Tonto near Roosevelt
(1913–1940)
D.A. = 841 mi.2
Salt near Roosevelt
(1913–Present)
D.A. = 4306 mi.2
Tonto at Livingstone
(at Roosevelt)
(1901–1903)
D.A. = 1050 mi.2
Salt at Roosevelt
(1888–1914?)
D.A. = ~5830 mi.2
ROOSEVELT DAM
VERDE RIVER
SALT RIVER
Verde below Tangle
(1946–Present)
D.A. = 5858 mi.2
HORSESHOE DAM
HORSE MESA DAM
Verde above Bartlett
(1938–1945)
D.A. = 6040 mi.2
BARTLETT DAM
MORMON FLAT DAM
Verde below Bartlett
(or above Campcreek)
(1925–Present)
D.A. = 6161 mi.2
STEWART MOUNTAIN DAM
Verde near
Scottsdale
(1960–Present)
D.A. = 6615 mi.2
Salt below Stewart Mtn Dam
(1930–Present)
D.A. = 6232 mi.2
Verde near McDowell
(1888–1925)
D.A. = ~6620 mi.2
Salt at McDowell
(1899–1910)
D.A. = ~6280 mi.2
Salt at Arizona Dam
(1895–1911)
D.A. = 12,900 mi.2
SALT RIVER
NOT TO SCALE
Inactive Gage
Active Gage
SALT RIVER PROJECT
STREAM GAGE LOCATION MAP
(1888 – Present)
U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

FIGURE 1

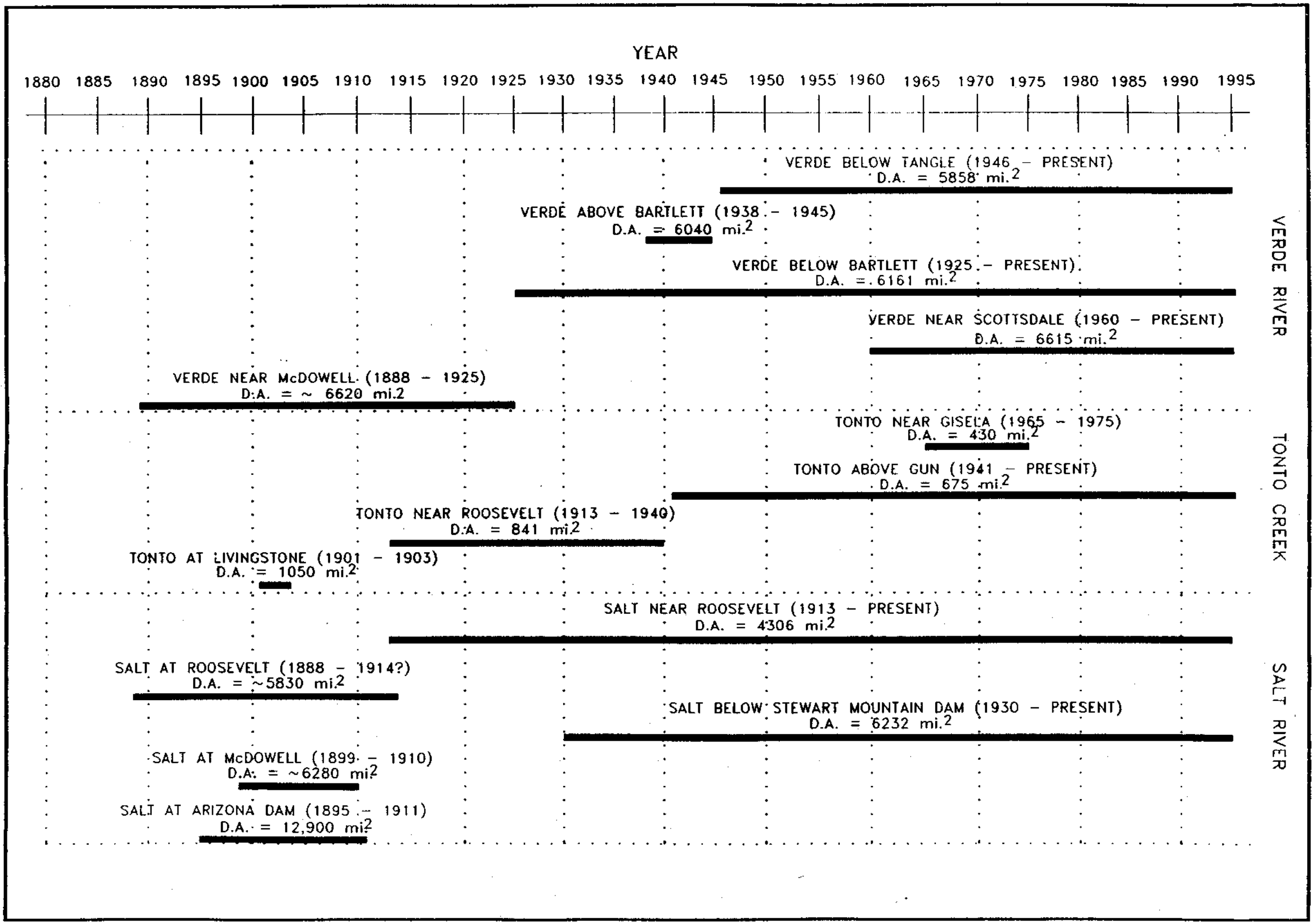
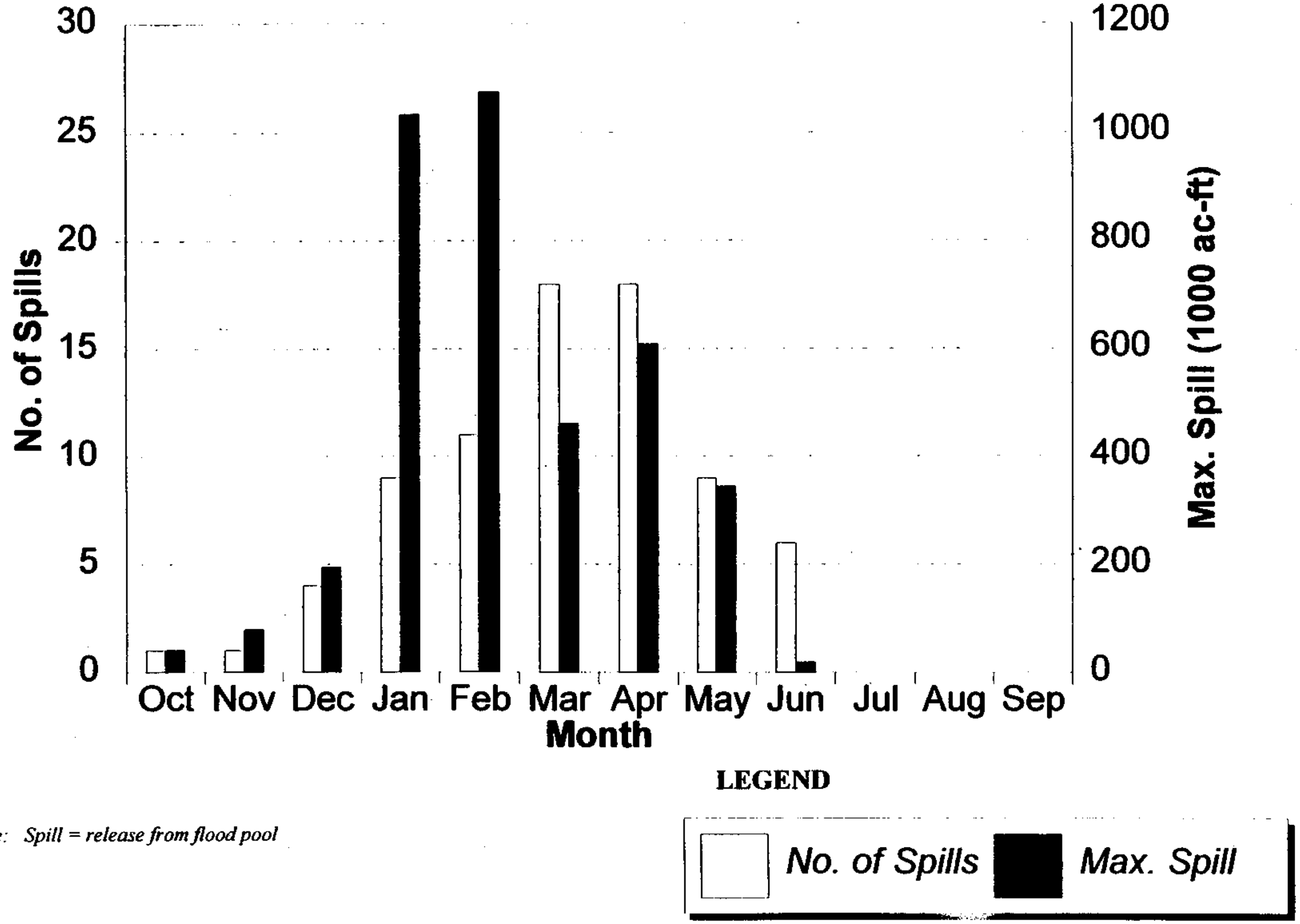


FIGURE 2

STREAMGAGES IN SALT RIVER BASIN - TIMELINE

Section 7 - Roosevelt Dam
Modified Roosevelt Dam Spilling Frequency

Simulation Results, 1889 - 1993

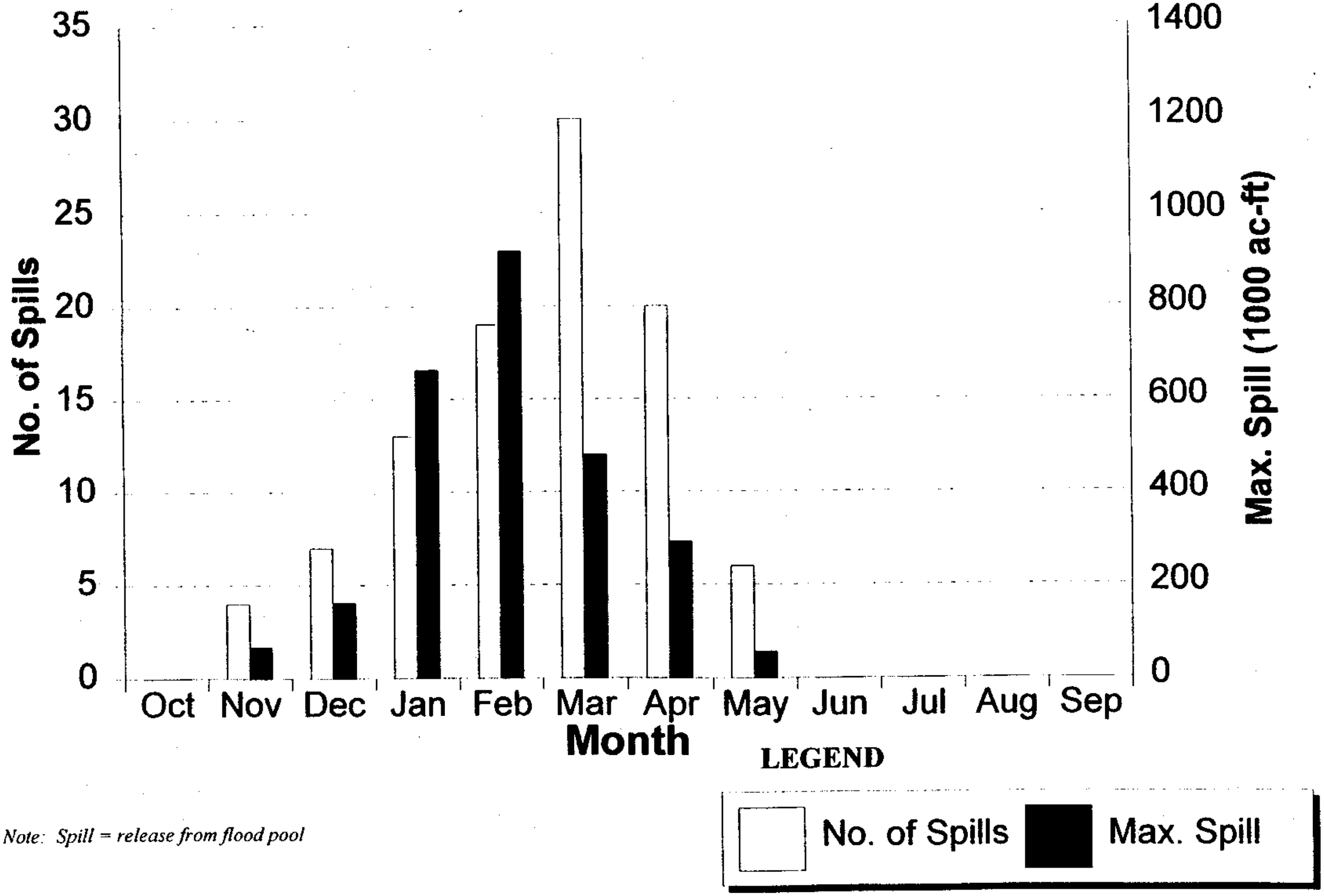


Note: Spill = release from flood pool

FIGURE 3-1

Section 7 - Roosevelt Dam
Bartlett Dam Spilling Frequency

Simulation Results, 1889 - 1993

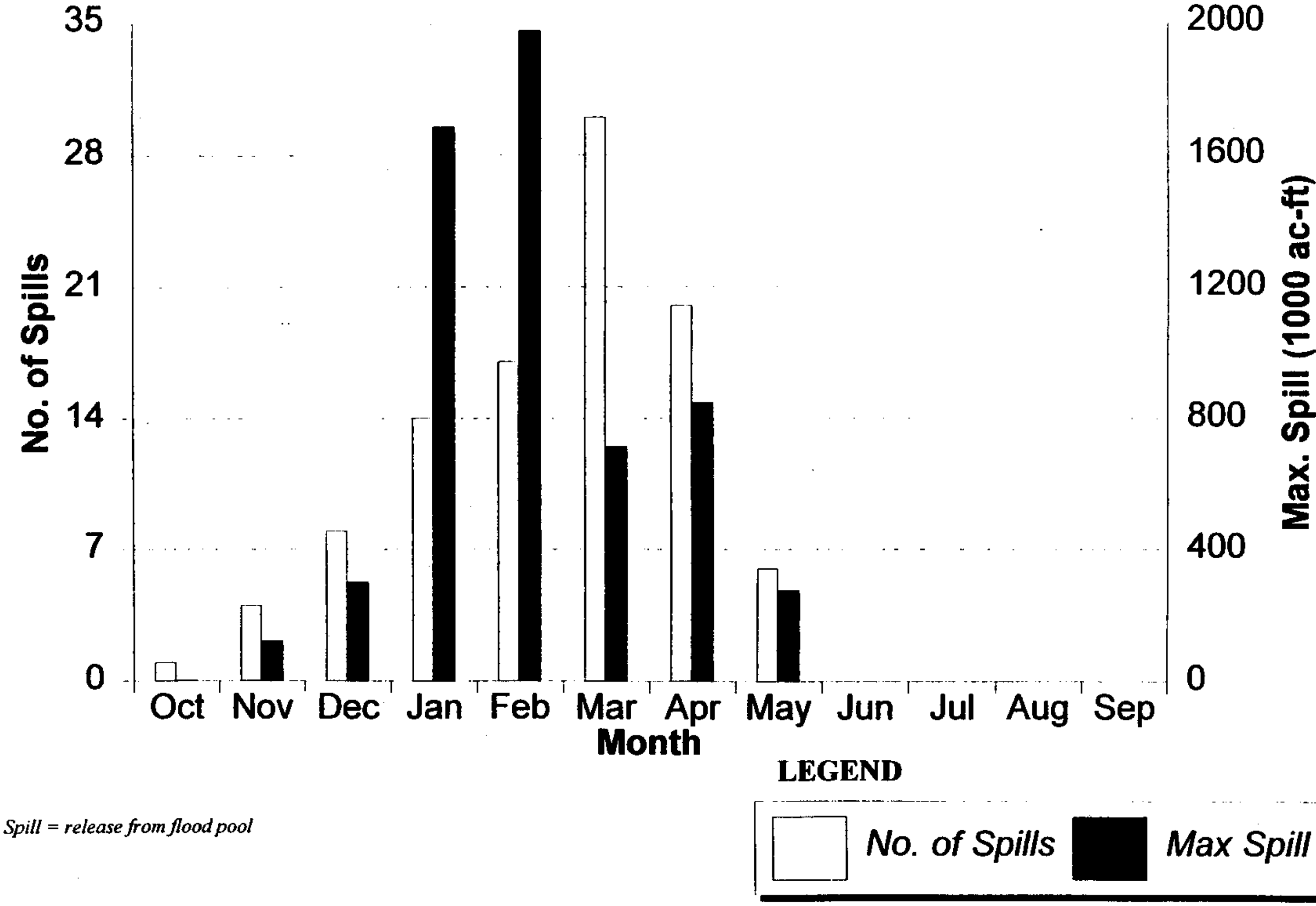


Note: Spill = release from flood pool

FIGURE 3-2

Section 7 - Roosevelt Dam
Granite Reef Dam Spilling Frequency

Simulation Results, 1889 - 1993



Note: Spill = release from flood pool

FIGURE 3-3

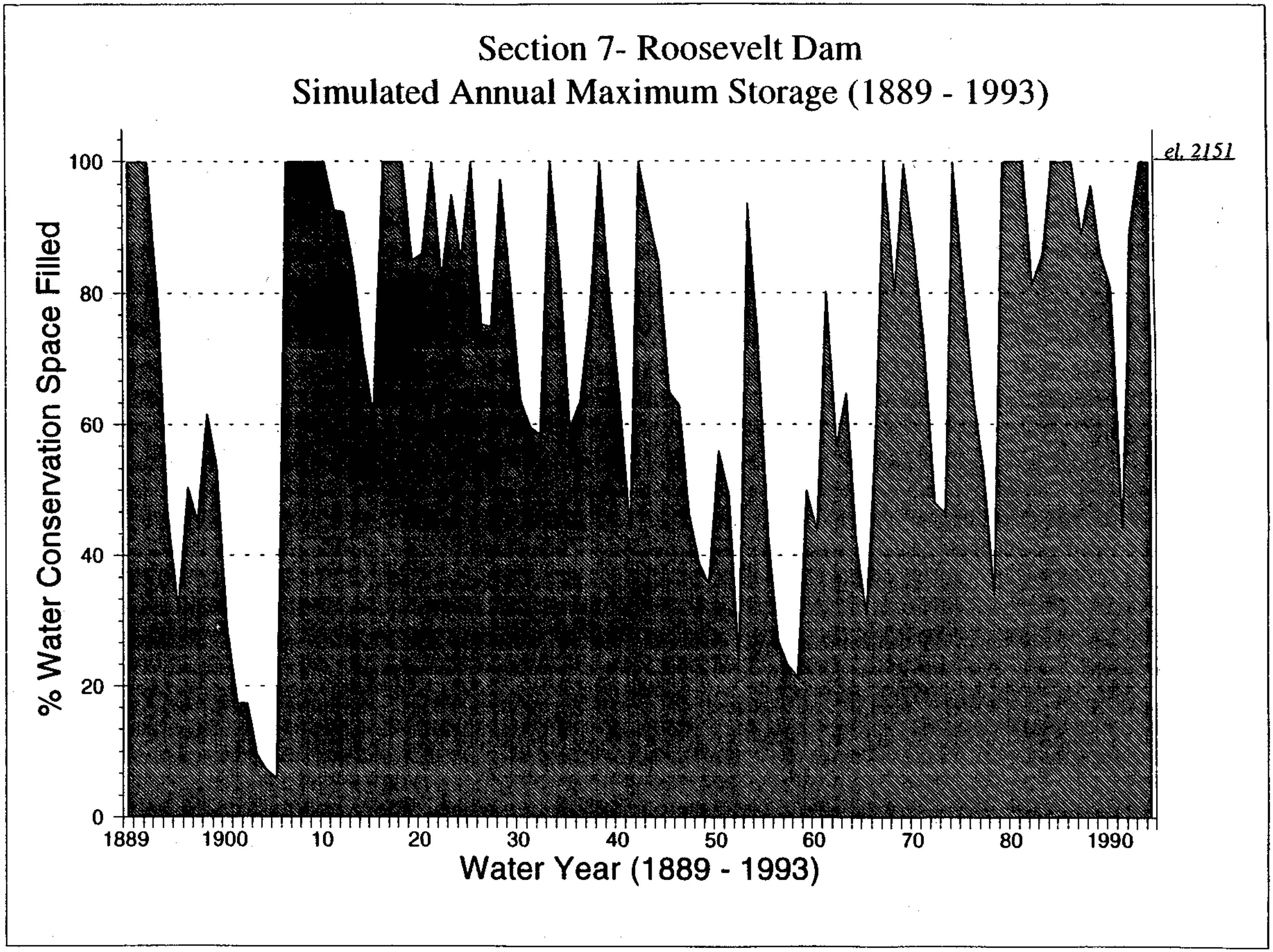

Section 7- Roosevelt Dam
Simulated Annual Maximum Storage (1889 - 1993)
% Water Conservation Space Filled
Water Year (1889 - 1993)
el. 2151
0
20
40
60
80
100
1889
1900
10
20
30
40
50
60
70
80
1990

FIGURE 4-1

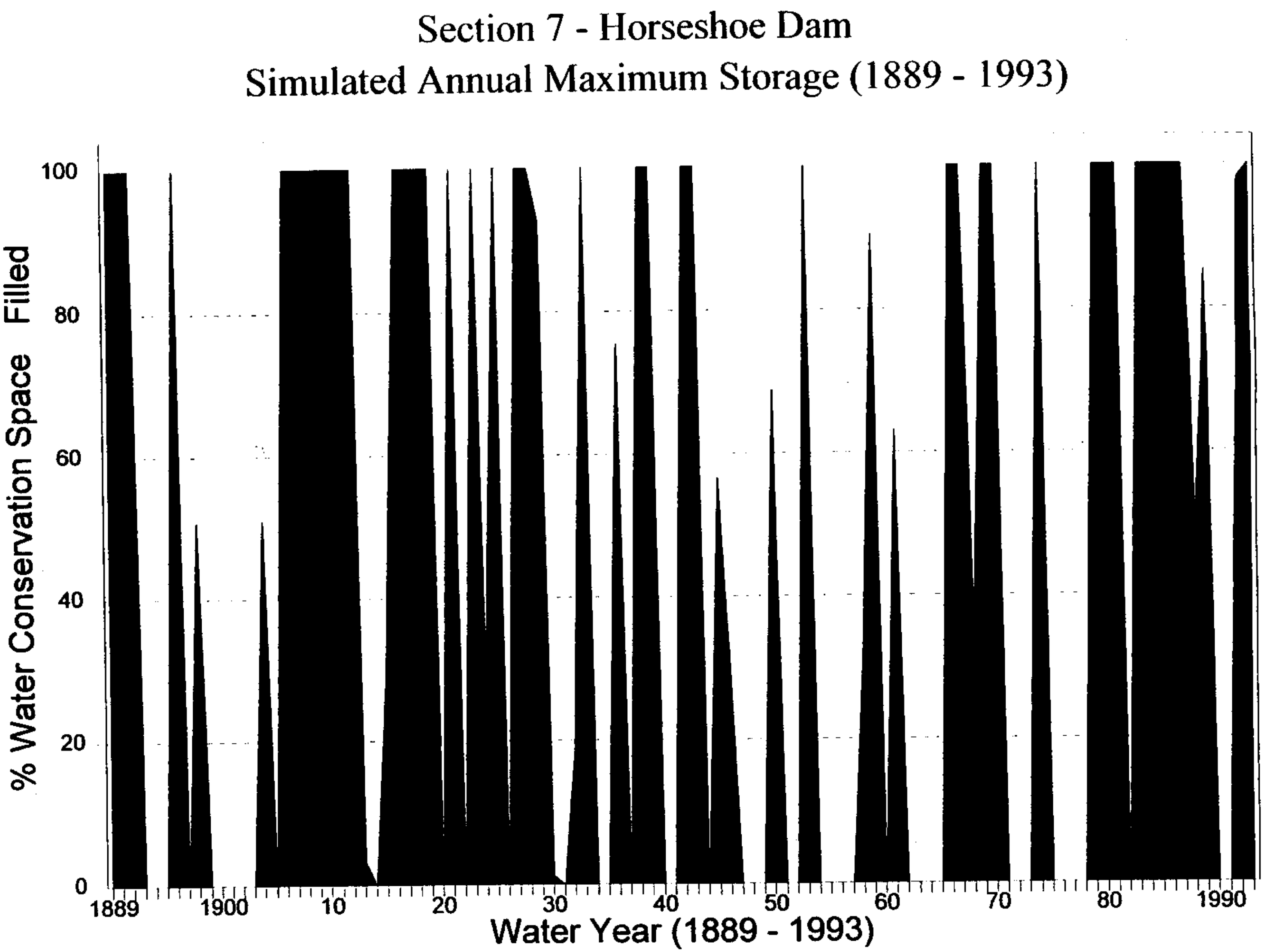

Section 7 - Horseshoe Dam
Simulated Annual Maximum Storage (1889 - 1993)
% Water Conservation Space Filled
100
80
60
40
20
0
1889
1900
10
20
30
40
50
60
70
80
1990
Water Year (1889 - 1993)

FIGURE 4-2

Section 7 - Bartlett Dam
Simulated Annual Maximum Storage (1889 - 1993)

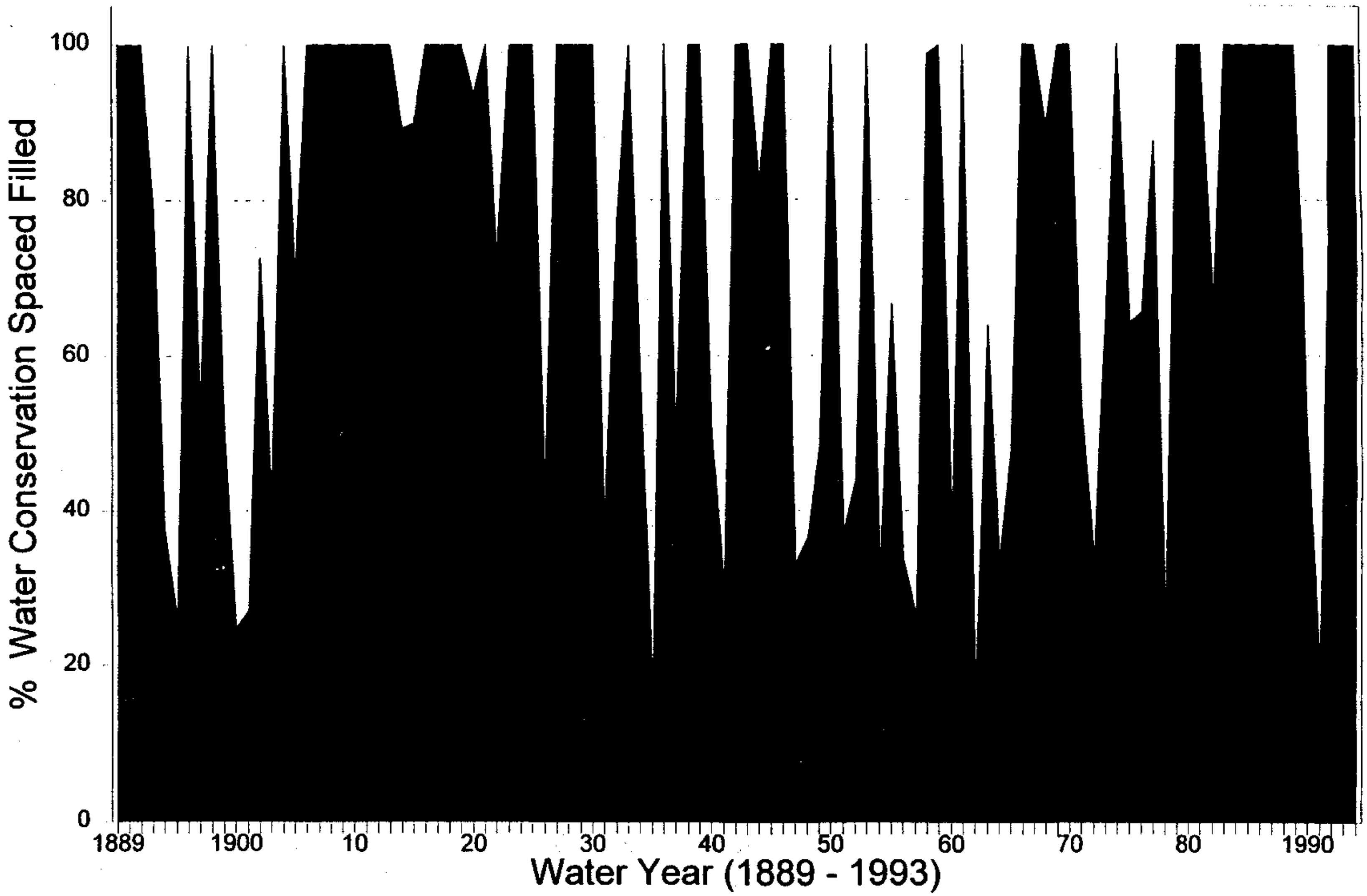


FIGURE 4-3

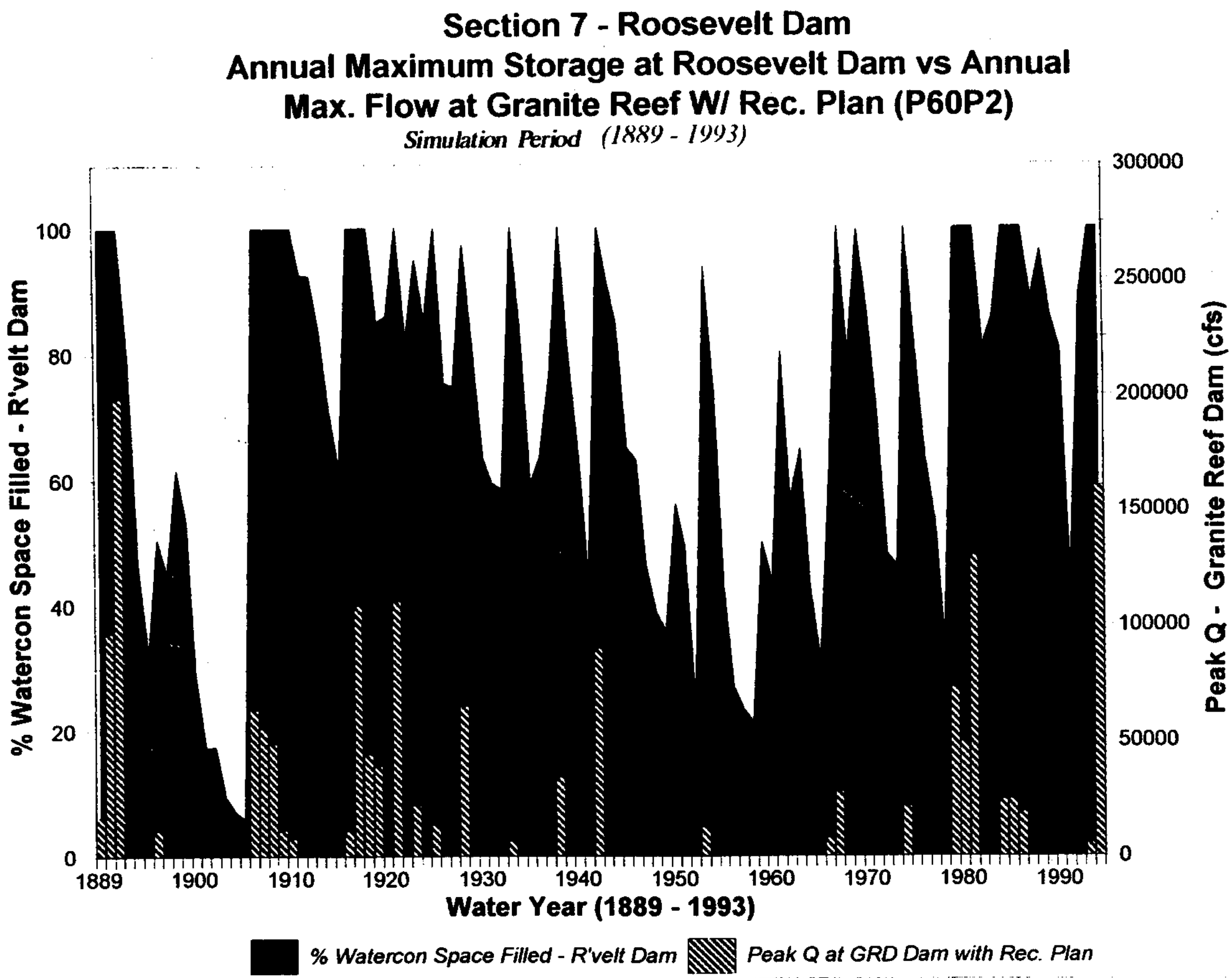

Section 7 - Roosevelt Dam
Annual Maximum Storage at Roosevelt Dam vs Annual
Max. Flow at Granite Reef W/ Rec. Plan (P60P2)
Simulation Period (1889 - 1993)
% Watercon Space Filled - R'velt Dam
0
20
40
60
80
100
Peak Q - Granite Reef Dam (cfs)
0
50000
100000
150000
200000
250000
300000
1889
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
Water Year (1889 - 1993)
% Watercon Space Filled - R'velt Dam
Peak Q at GRD Dam with Rec. Plan

FIGURE 5

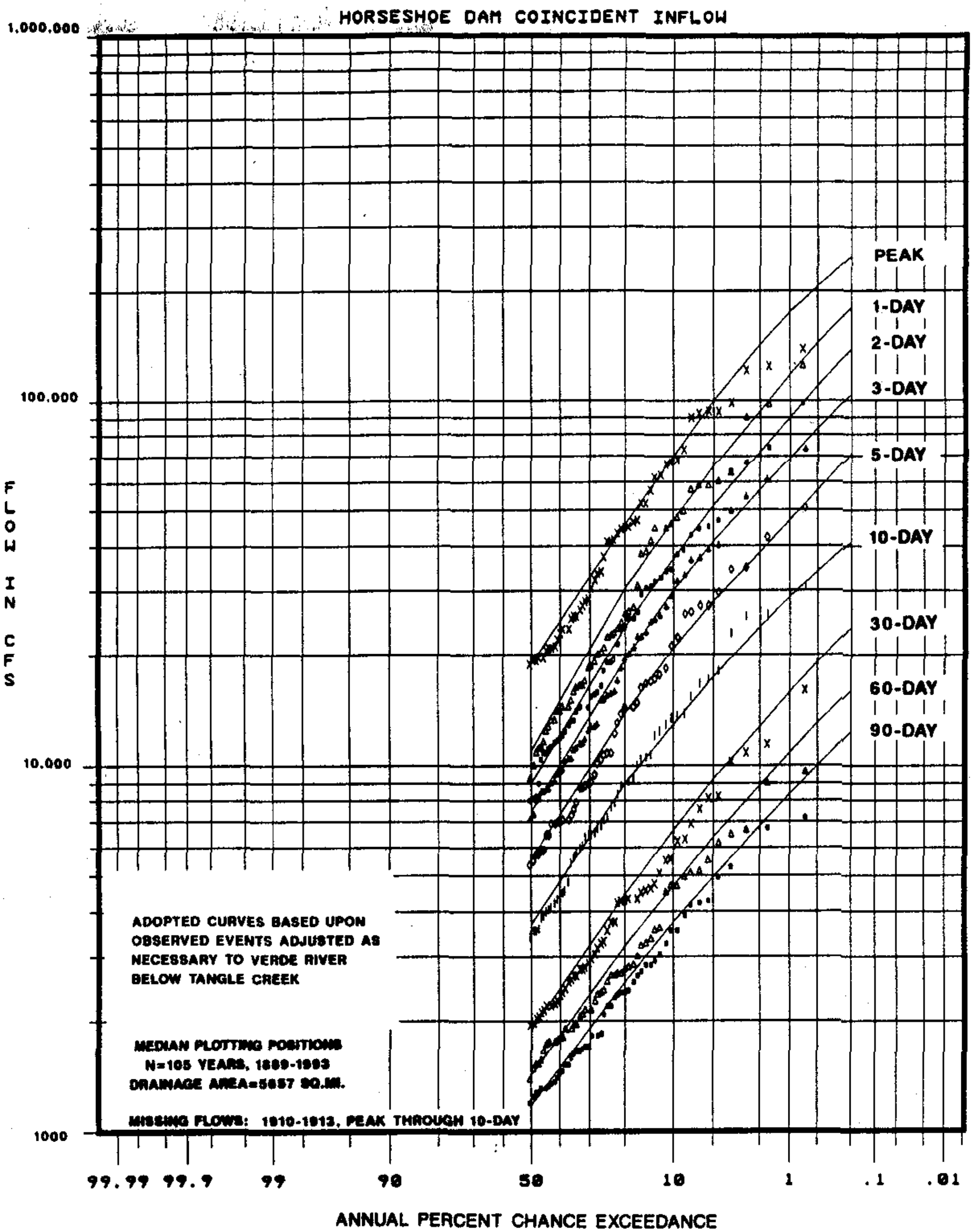

HORSESHOE DAM COINCIDENT INFLOW
1,000,000
100,000
10,000
1000
FLOW IN CFS
PEAK
1-DAY
2-DAY
3-DAY
5-DAY
10-DAY
30-DAY
60-DAY
90-DAY
ADOPTED CURVES BASED UPON OBSERVED EVENTS ADJUSTED AS NECESSARY TO VERDE RIVER BELOW TANGLE CREEK
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5857 SQ.MI.
MISSING FLOWS: 1910-1913, PEAK THROUGH 10-DAY
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE

FIGURE 6-1

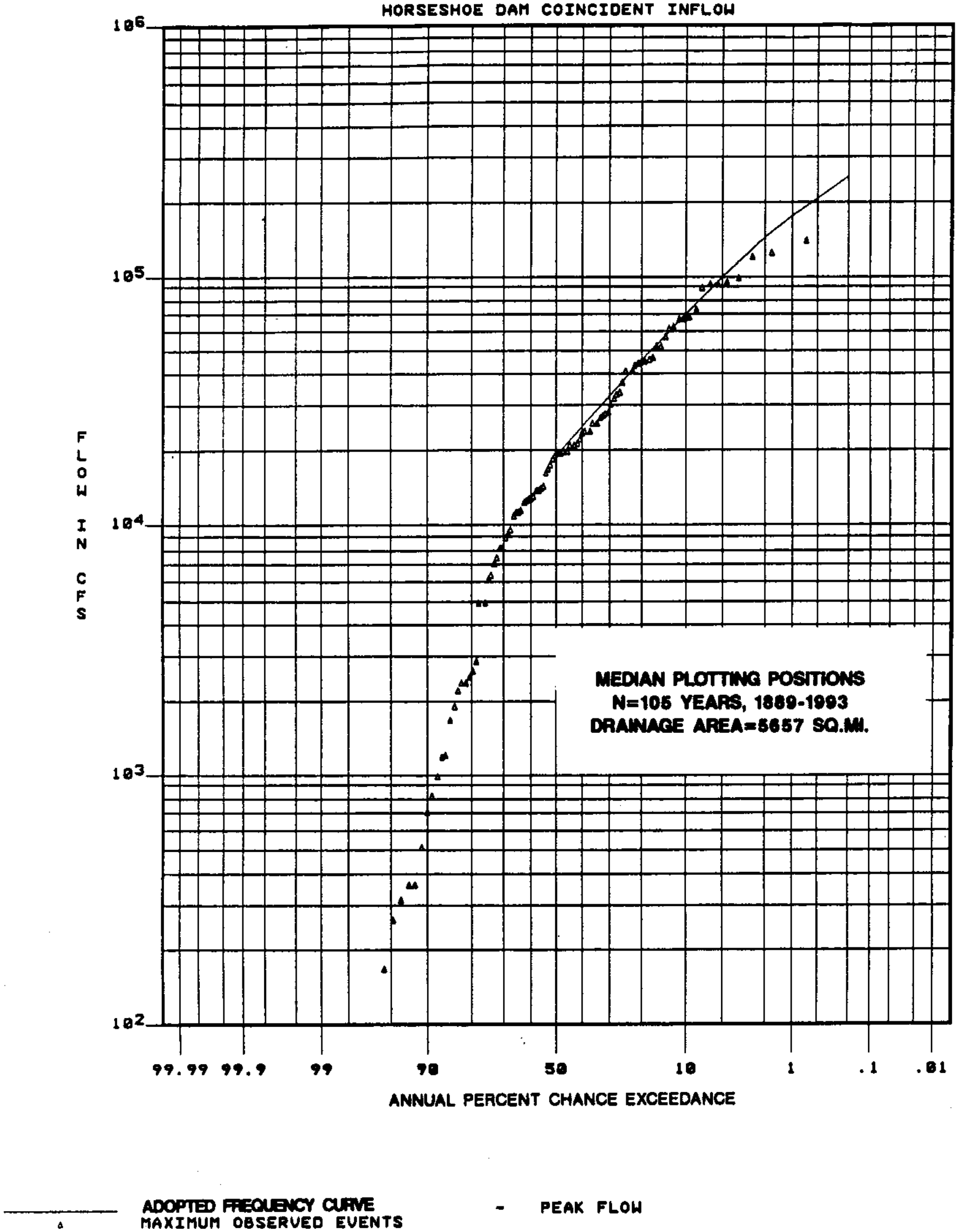

HORSESHOE DAM COINCIDENT INFLOW
10^6
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5657 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE
MAXIMUM OBSERVED EVENTS
- PEAK FLOW

FIGURE 6-2

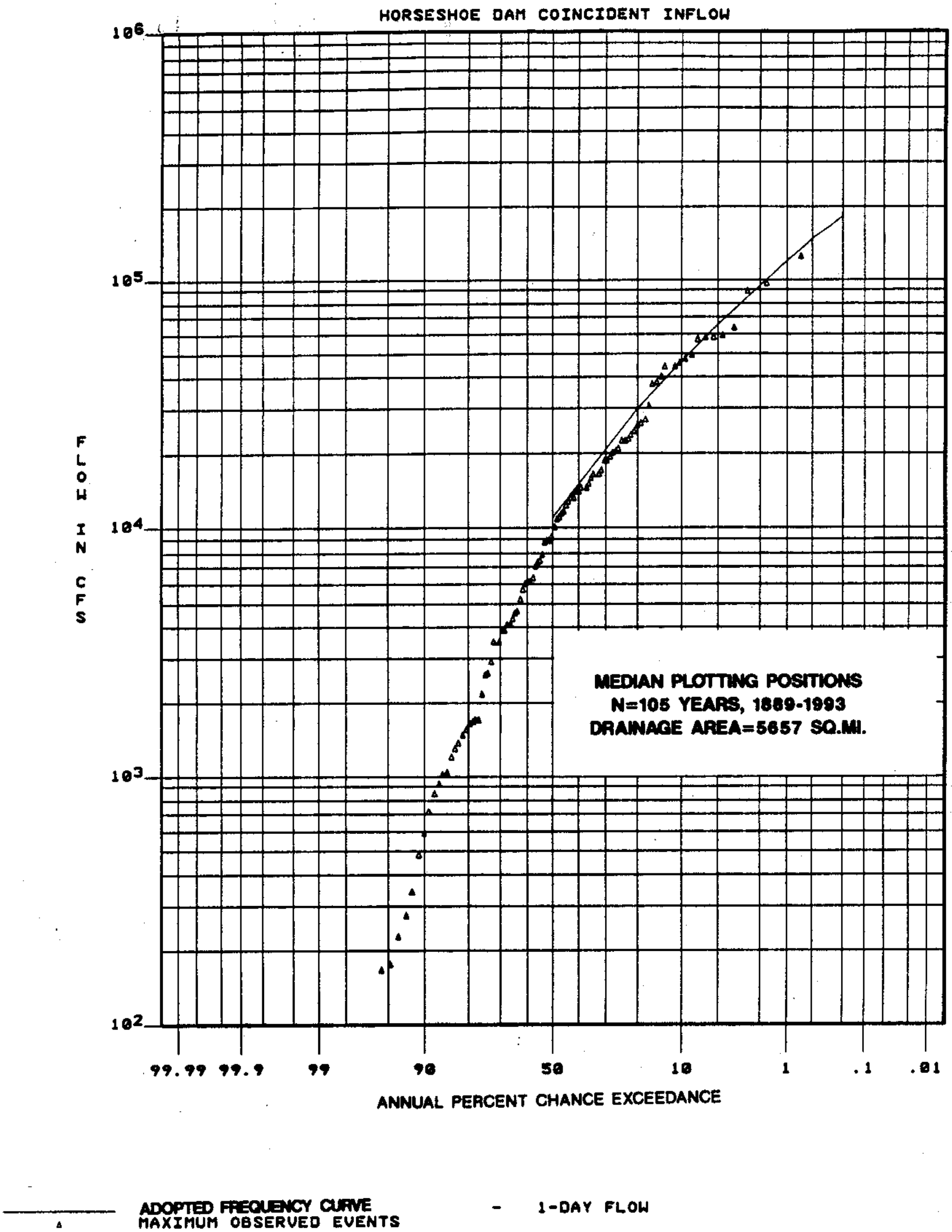

HORSESHOE DAM COINCIDENT INFLOW
FLOW IN CFS
10^6
10^5
10^4
10^3
10^2
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5657 SQ.MI.
ADOPTED FREQUENCY CURVE - 1-DAY FLOW
MAXIMUM OBSERVED EVENTS

FIGURE 6-3

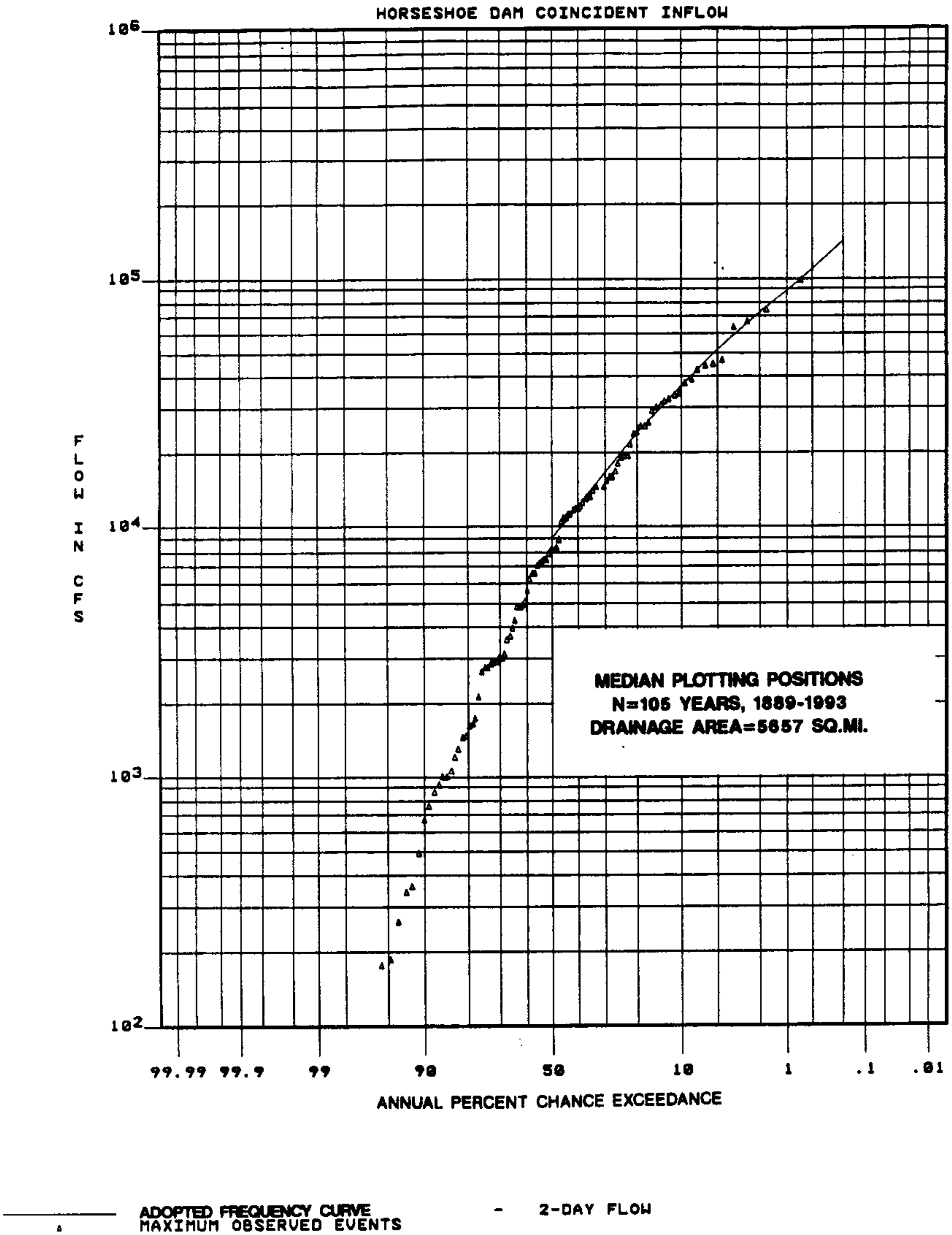

HORSESHOE DAM COINCIDENT INFLOW
10^6
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5657 SQ.MI.
99.99
99.9
99
90
50
10
1
.1
.01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE
MAXIMUM OBSERVED EVENTS
- 2-DAY FLOW

FIGURE 6-4

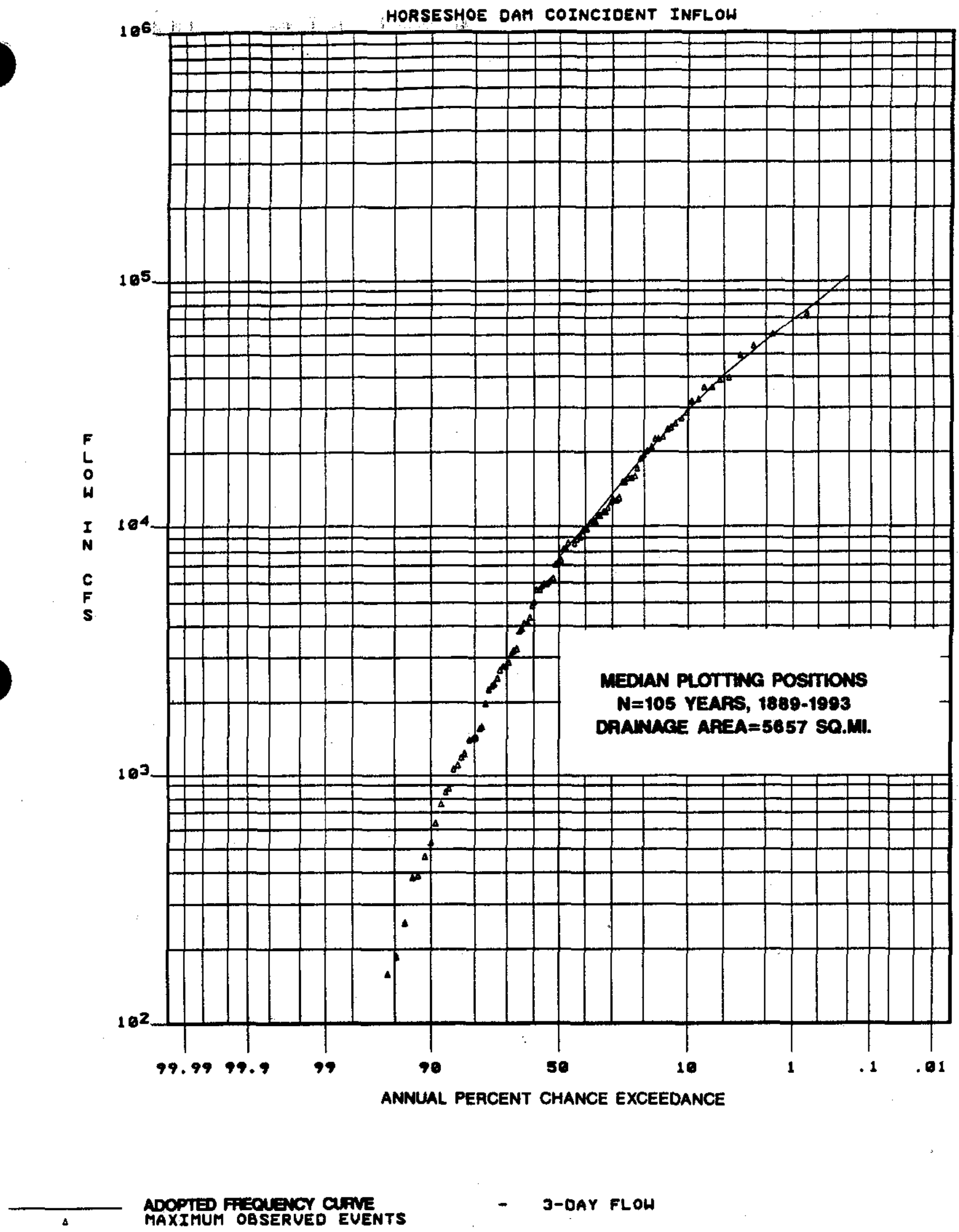

HORSESHOE DAM COINCIDENT INFLOW
10^6
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5657 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE - 3-DAY FLOW
MAXIMUM OBSERVED EVENTS

FIGURE 6-5

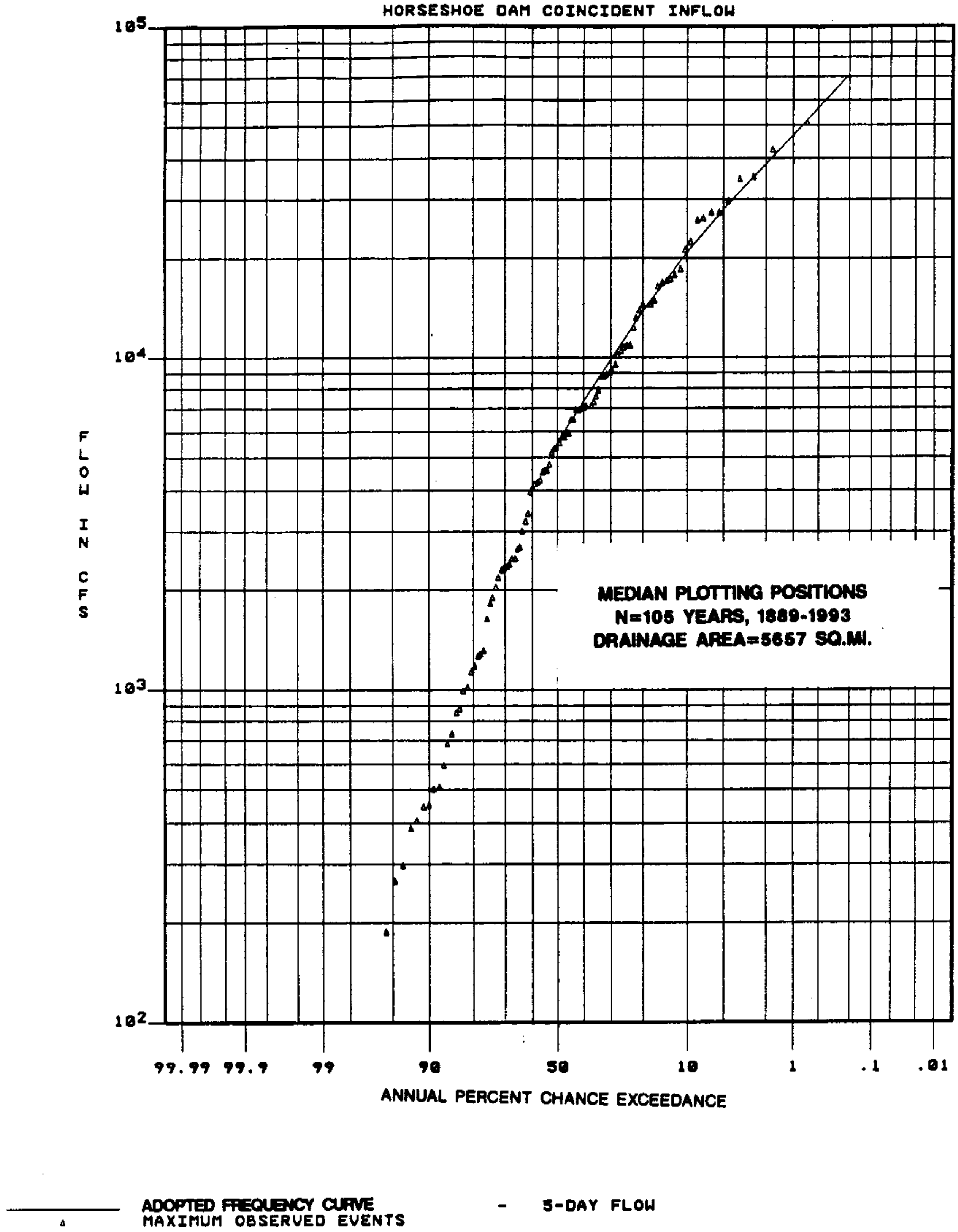
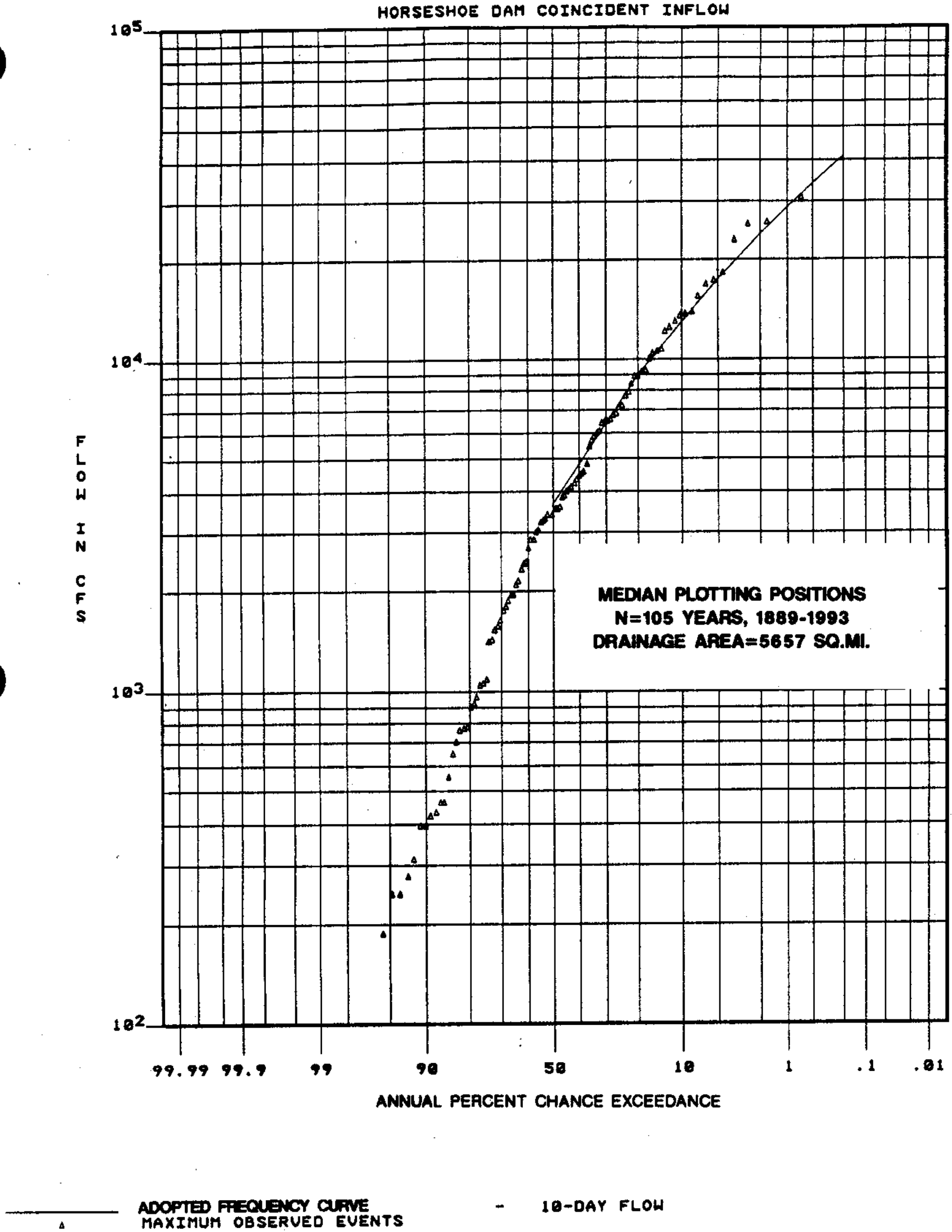

HORSESHOE DAM COINCIDENT INFLOW
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5657 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE - 5-DAY FLOW
MAXIMUM OBSERVED EVENTS

FIGURE 6-6



HORSESHOE DAM COINCIDENT INFLOW
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5657 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE
MAXIMUM OBSERVED EVENTS
- 10-DAY FLOW

FIGURE 6-7

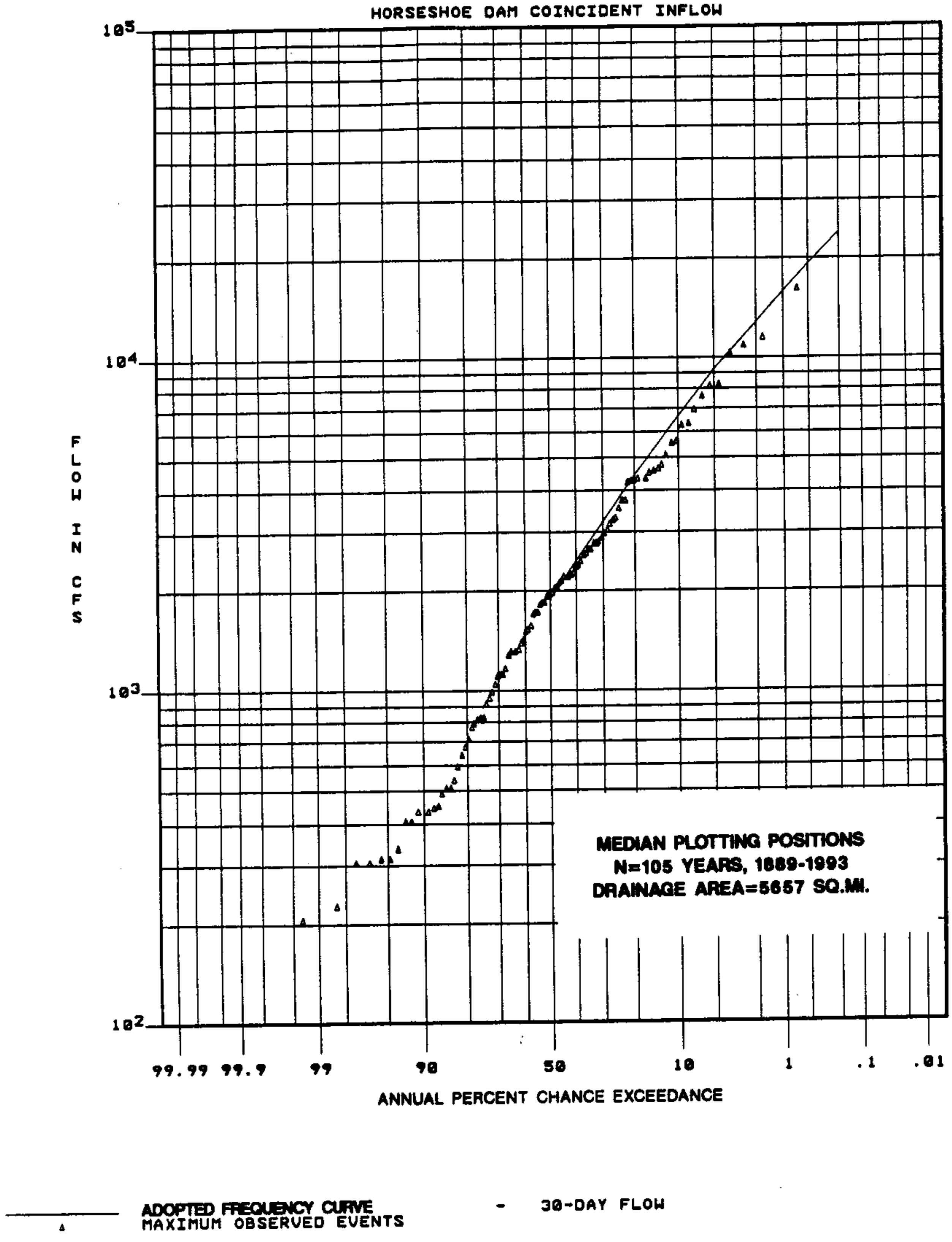

HORSESHOE DAM COINCIDENT INFLOW
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5657 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE - 30-DAY FLOW
MAXIMUM OBSERVED EVENTS

FIGURE 6-8

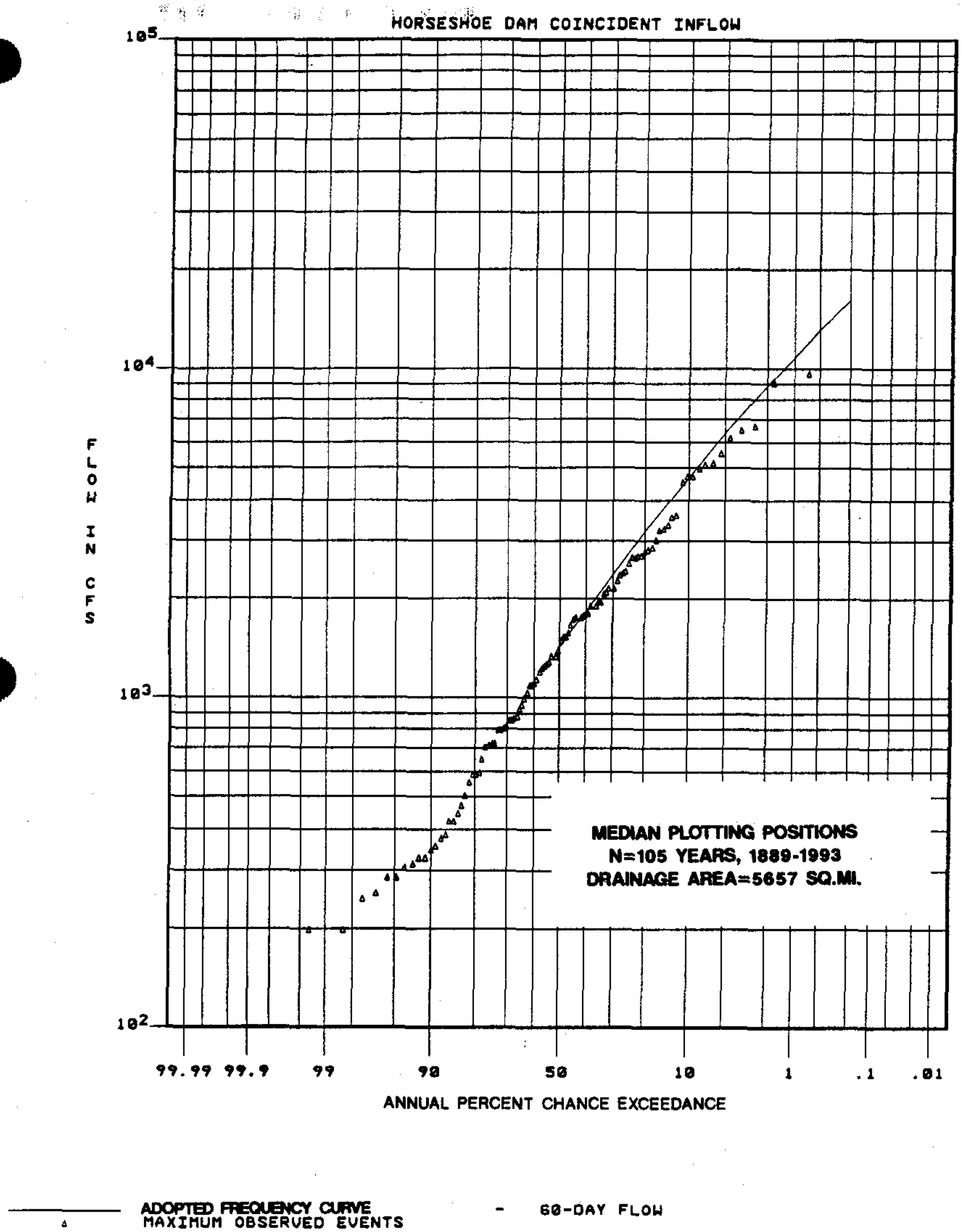

HORSESHOE DAM COINCIDENT INFLOW
10^5
10^4
10^3
10^2
FLOW IN CFS
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5657 SQ.MI.
ADOPTED FREQUENCY CURVE
MAXIMUM OBSERVED EVENTS
- 60-DAY FLOW

FIGURE 6-9

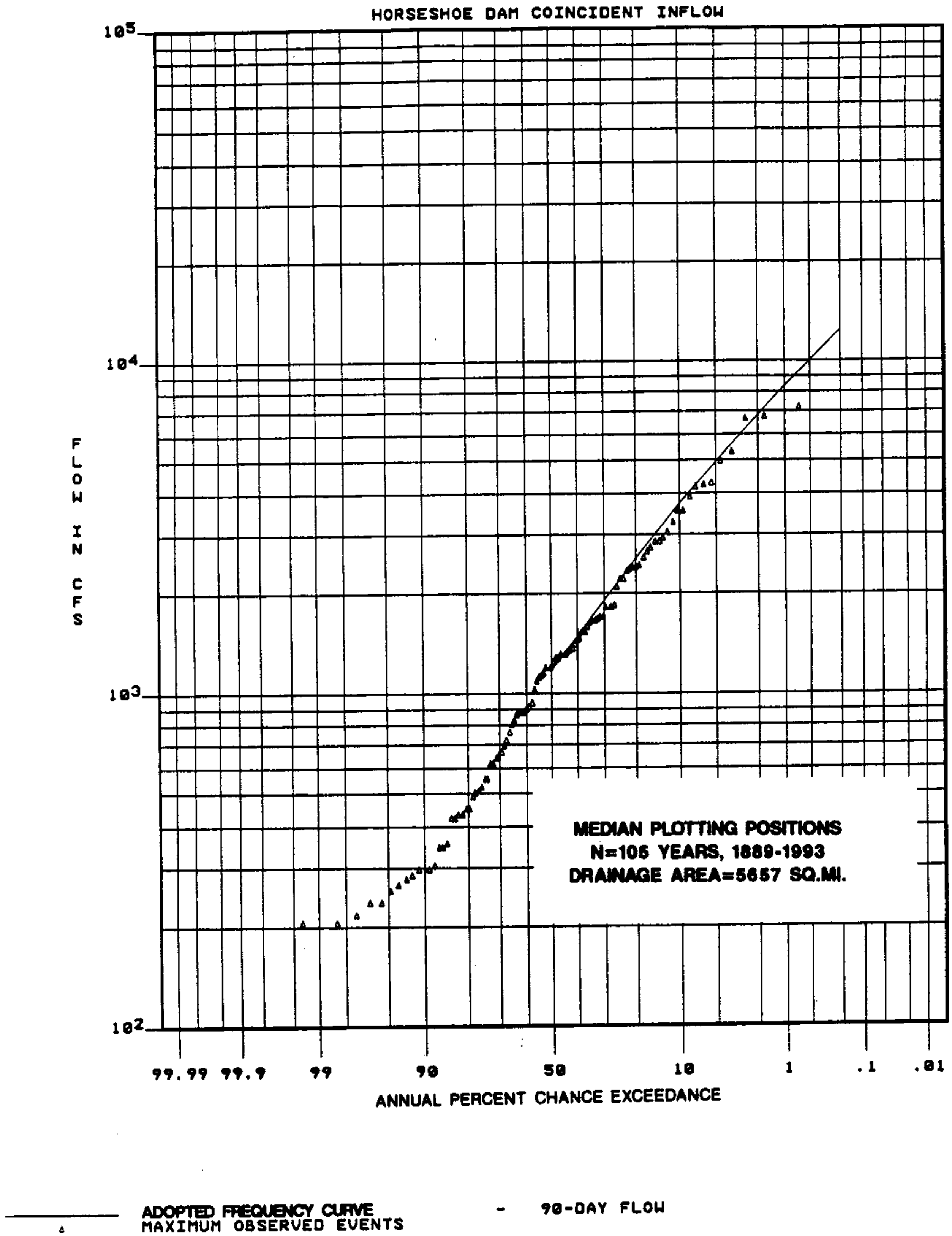
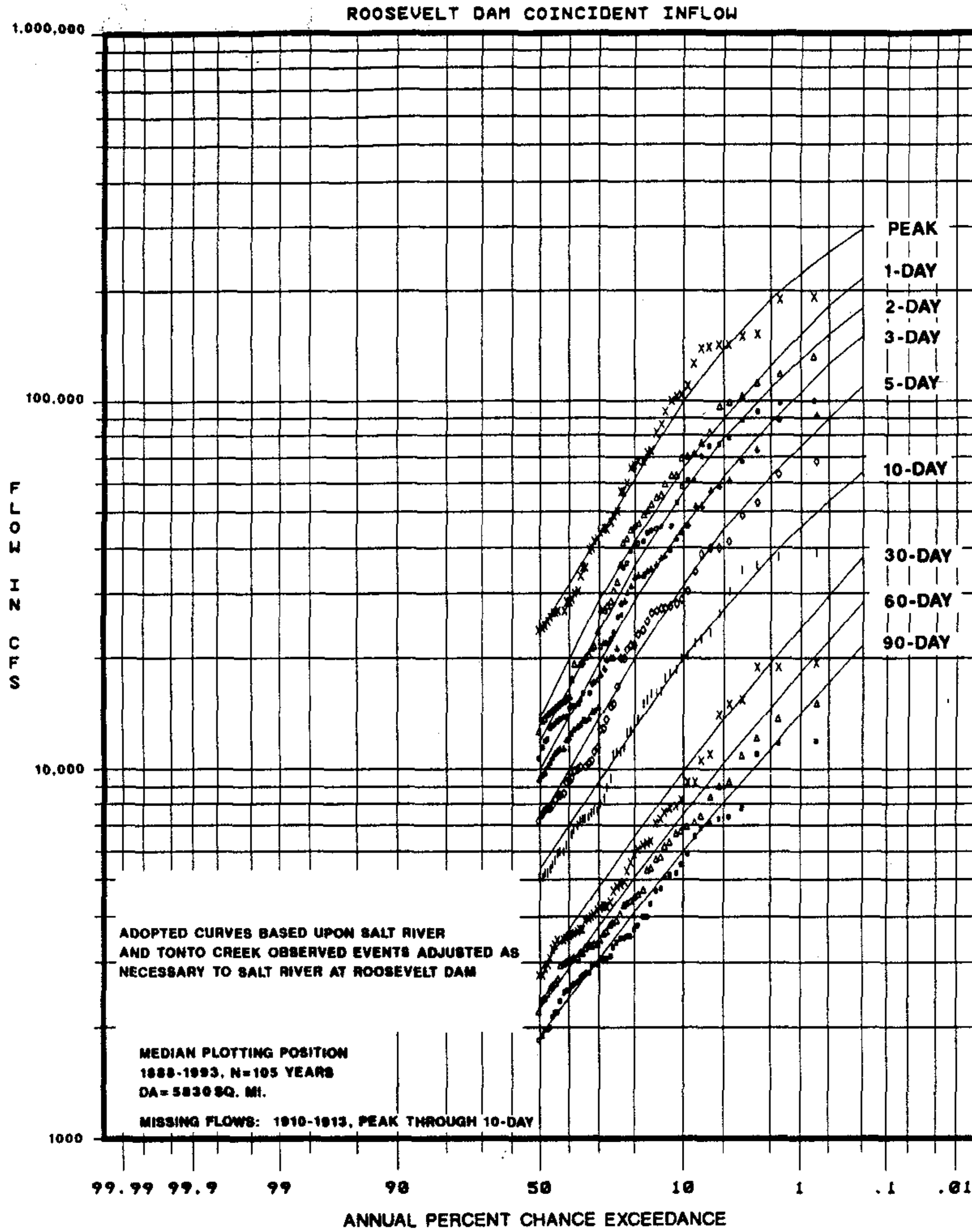

HORSESHOE DAM COINCIDENT INFLOW
10⁵
10⁴
10³
10²
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5657 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE
MAXIMUM OBSERVED EVENTS
- 90-DAY FLOW

FIGURE 6-10



ROOSEVELT DAM COINCIDENT INFLOW
1,000,000
100,000
10,000
1000
FLOW IN CFS
PEAK
1-DAY
2-DAY
3-DAY
5-DAY
10-DAY
30-DAY
60-DAY
90-DAY
ADOPTED CURVES BASED UPON SALT RIVER
AND TONTO CREEK OBSERVED EVENTS ADJUSTED AS
NECESSARY TO SALT RIVER AT ROOSEVELT DAM
MEDIAN PLOTTING POSITION
1888-1993, N=105 YEARS
DA=5830 SQ. MI.
MISSING FLOWS: 1910-1913, PEAK THROUGH 10-DAY
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE

FIGURE 7-1

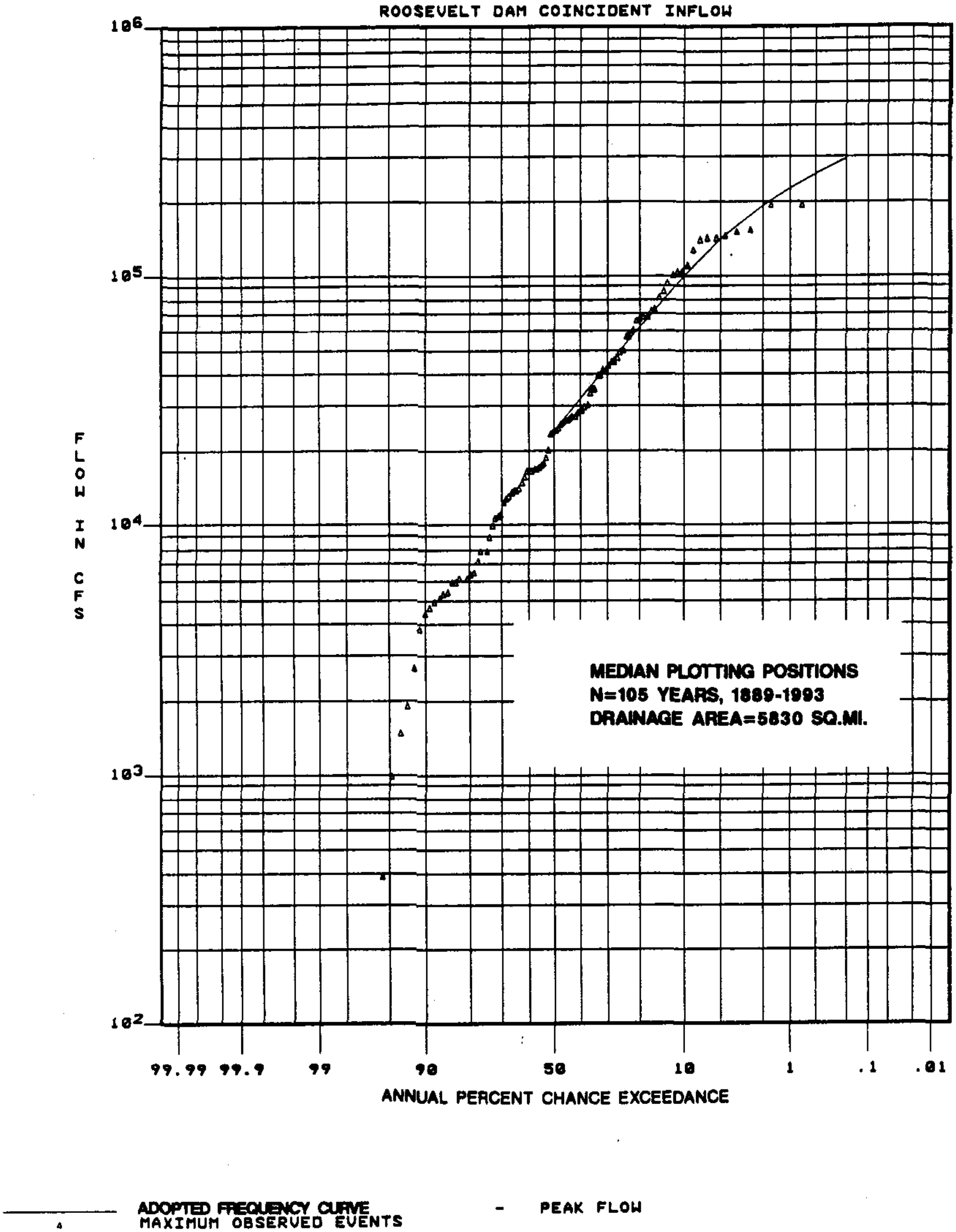
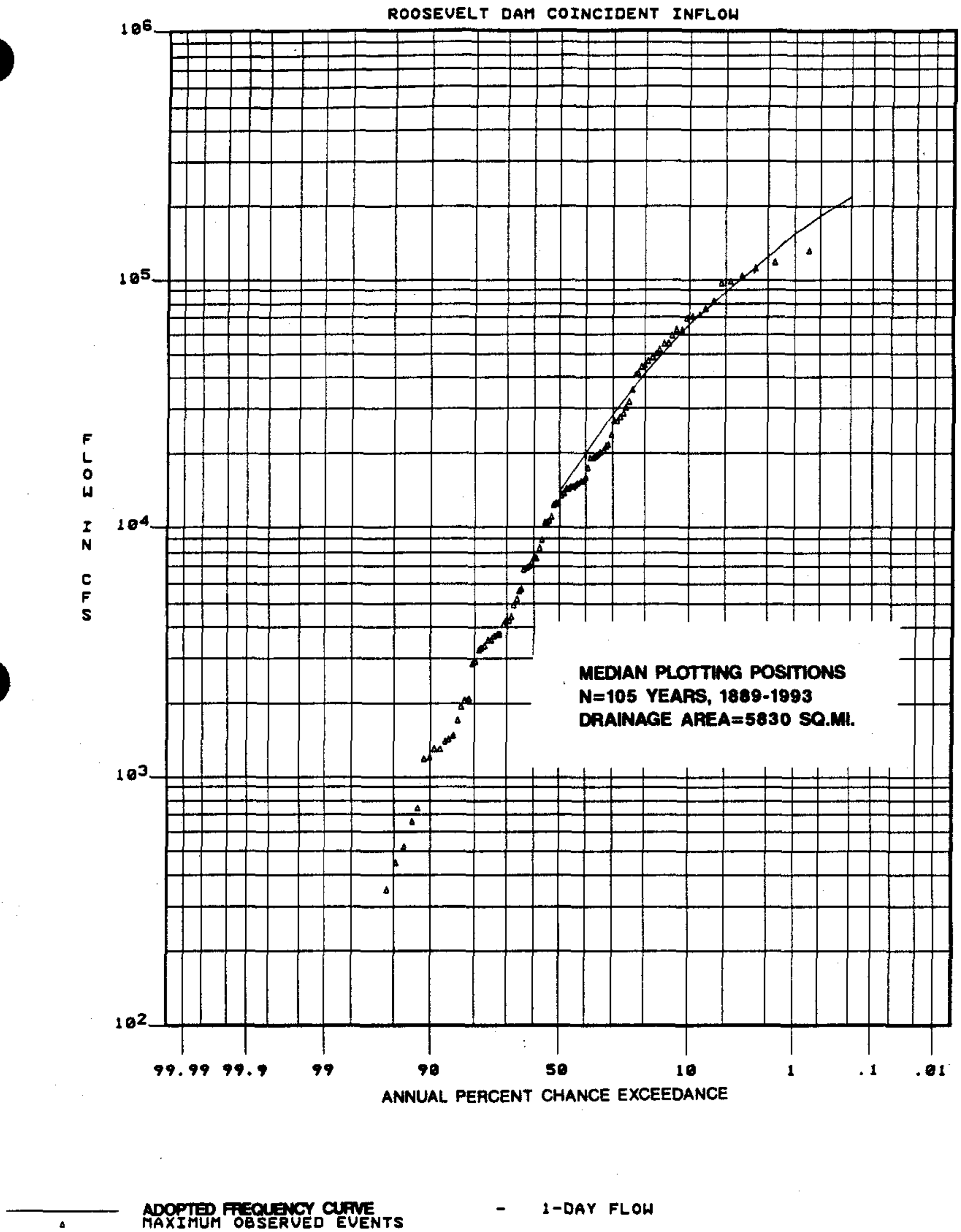

ROOSEVELT DAM COINCIDENT INFLOW
10^6
10^5
10^4
10^3
10^2
FLOW IN CFS
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5830 SQ.MI.
ADOPTED FREQUENCY CURVE
MAXIMUM OBSERVED EVENTS
- PEAK FLOW

FIGURE 7-2



ROOSEVELT DAM COINCIDENT INFLOW
10^6
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5830 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE - 1-DAY FLOW
MAXIMUM OBSERVED EVENTS

FIGURE 7-3

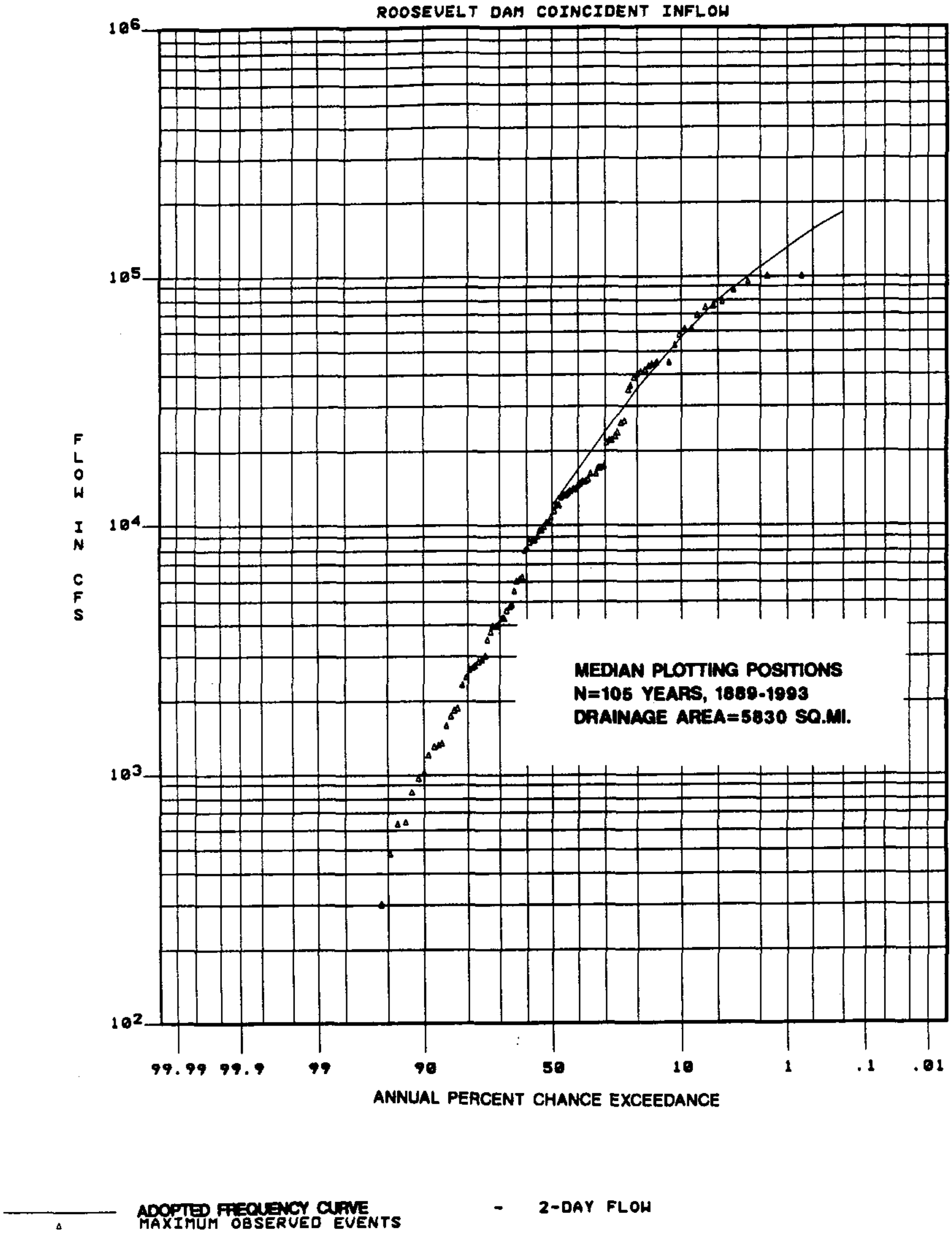

ROOSEVELT DAM COINCIDENT INFLOW
FLOW IN CFS
10^6
10^5
10^4
10^3
10^2
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5830 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE - 2-DAY FLOW
MAXIMUM OBSERVED EVENTS

FIGURE 7-4

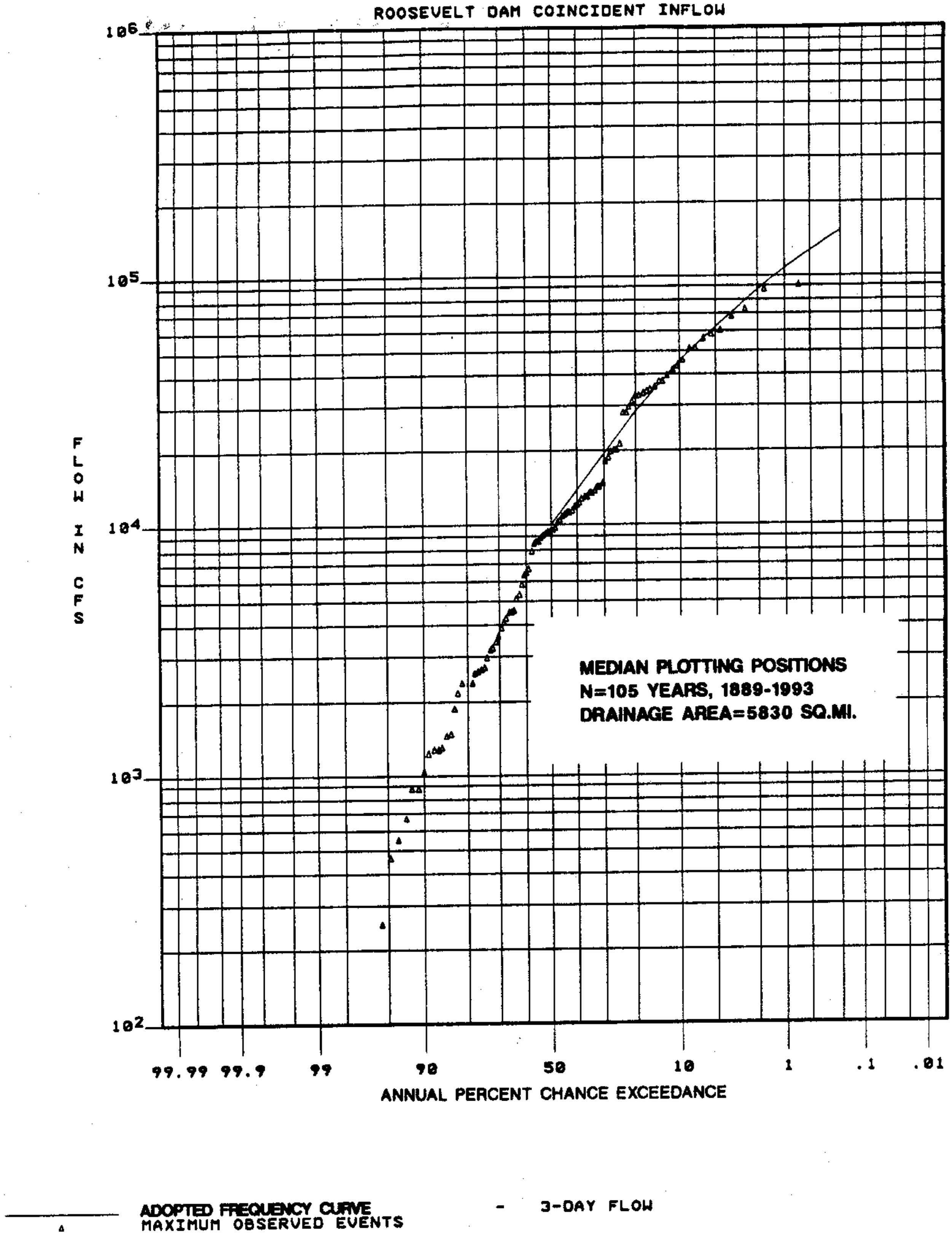
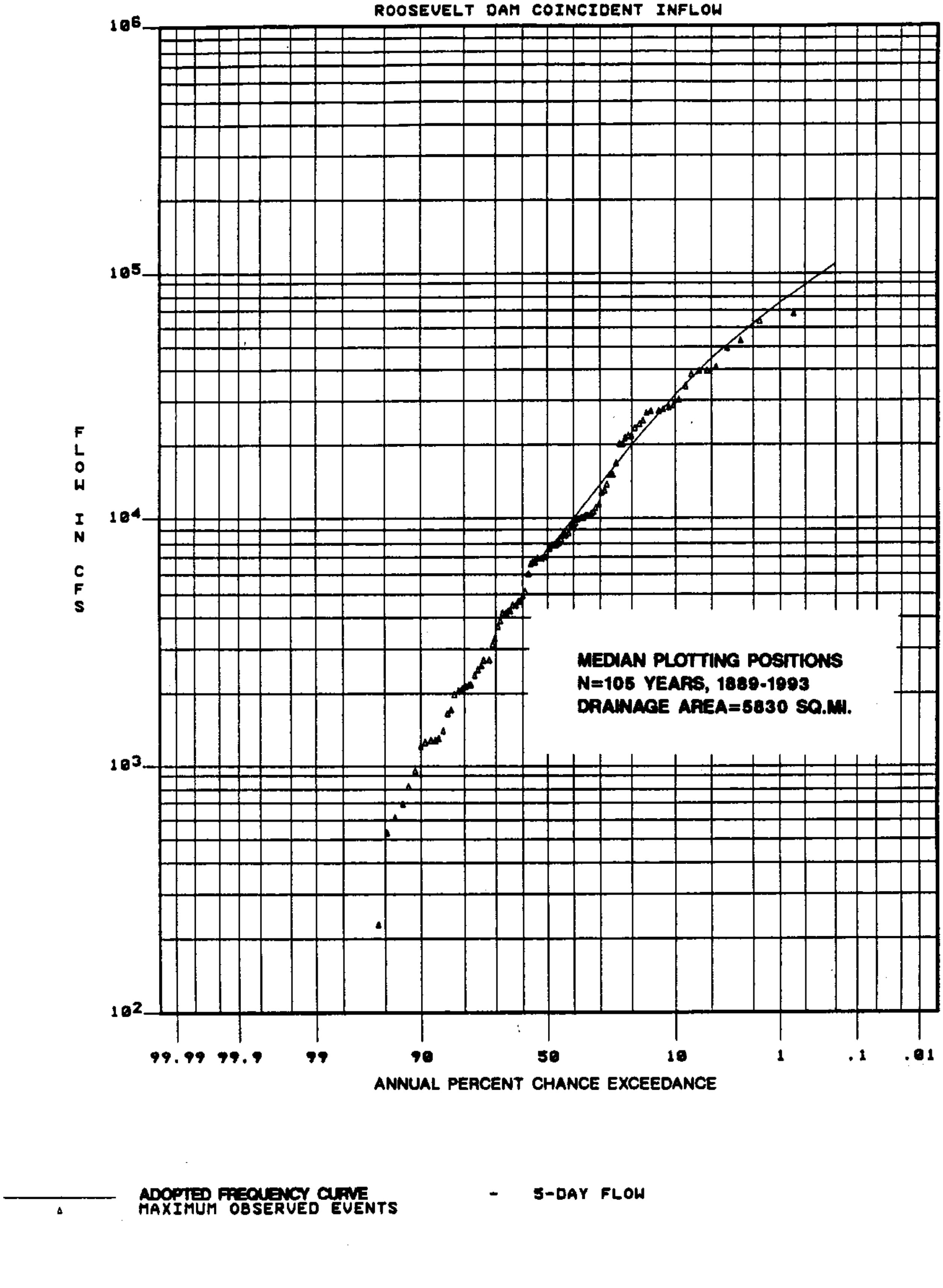

ROOSEVELT DAM COINCIDENT INFLOW
10^6
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5830 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE - 3-DAY FLOW
MAXIMUM OBSERVED EVENTS

FIGURE 7-5



ROOSEVELT DAM COINCIDENT INFLOW
10^6
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5830 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE - 5-DAY FLOW
MAXIMUM OBSERVED EVENTS

FIGURE 7-6

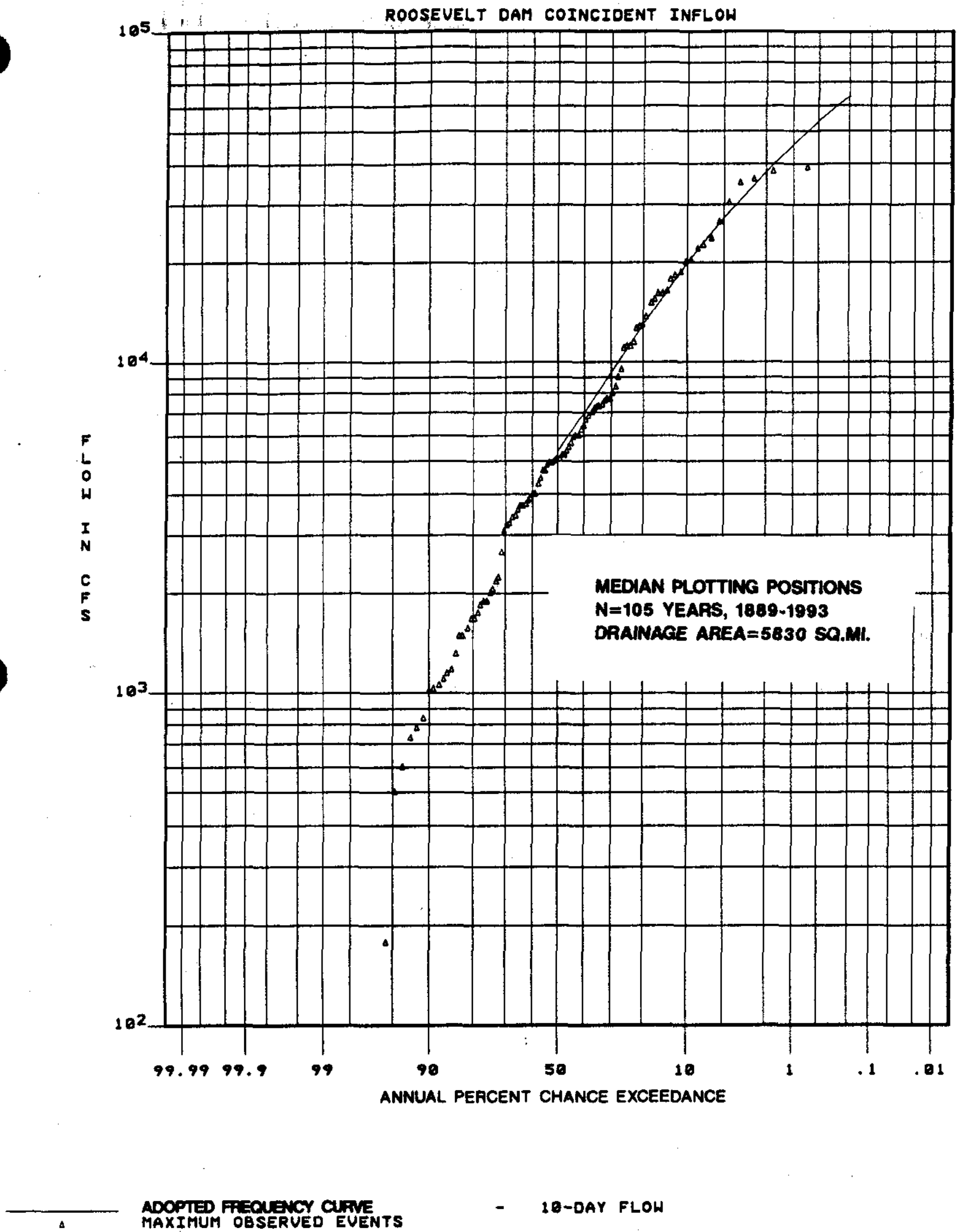

ROOSEVELT DAM COINCIDENT INFLOW
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5830 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE - 10-DAY FLOW
MAXIMUM OBSERVED EVENTS

FIGURE 7-7

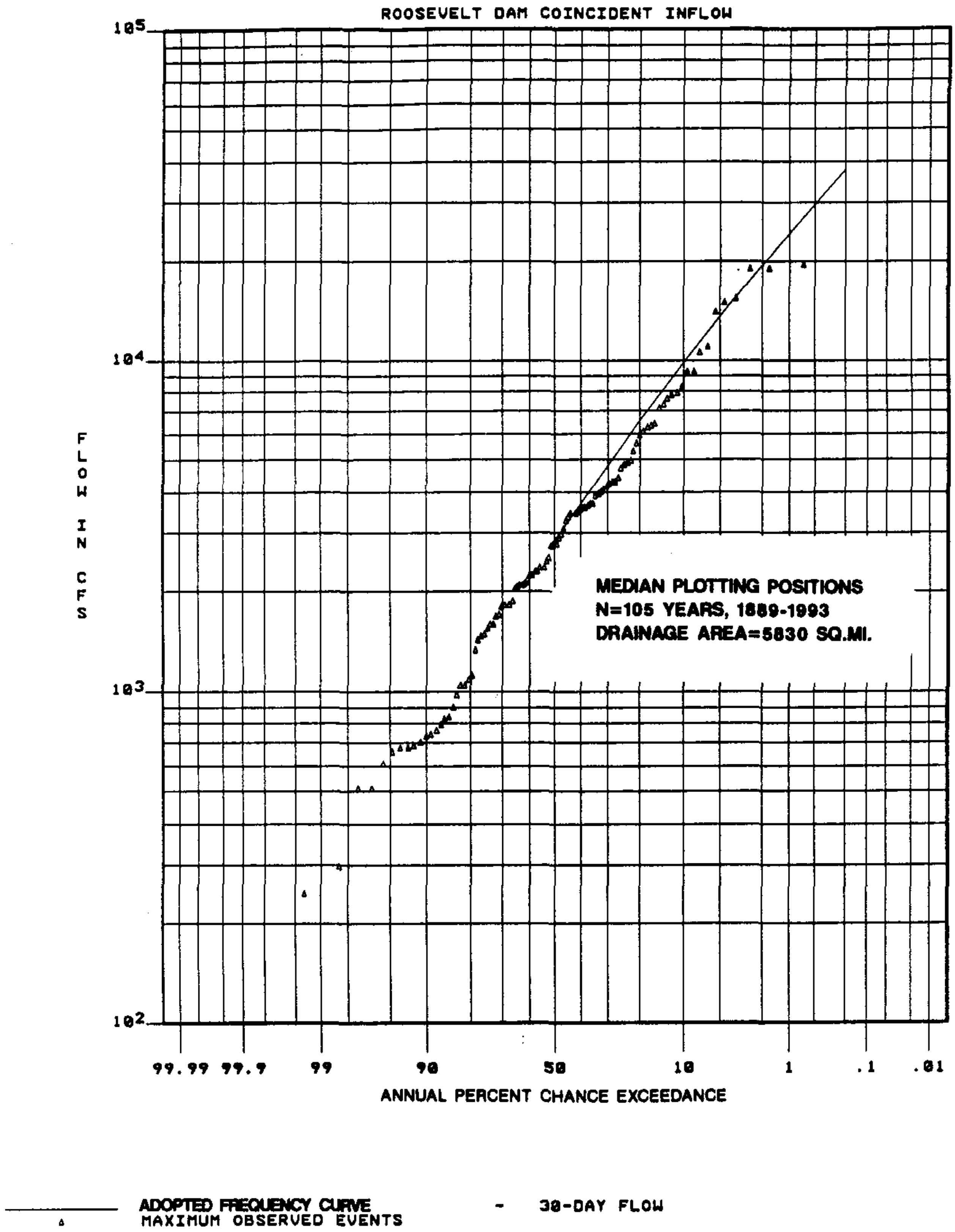

ROOSEVELT DAM COINCIDENT INFLOW
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5830 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE - 30-DAY FLOW
MAXIMUM OBSERVED EVENTS

FIGURE 7-8

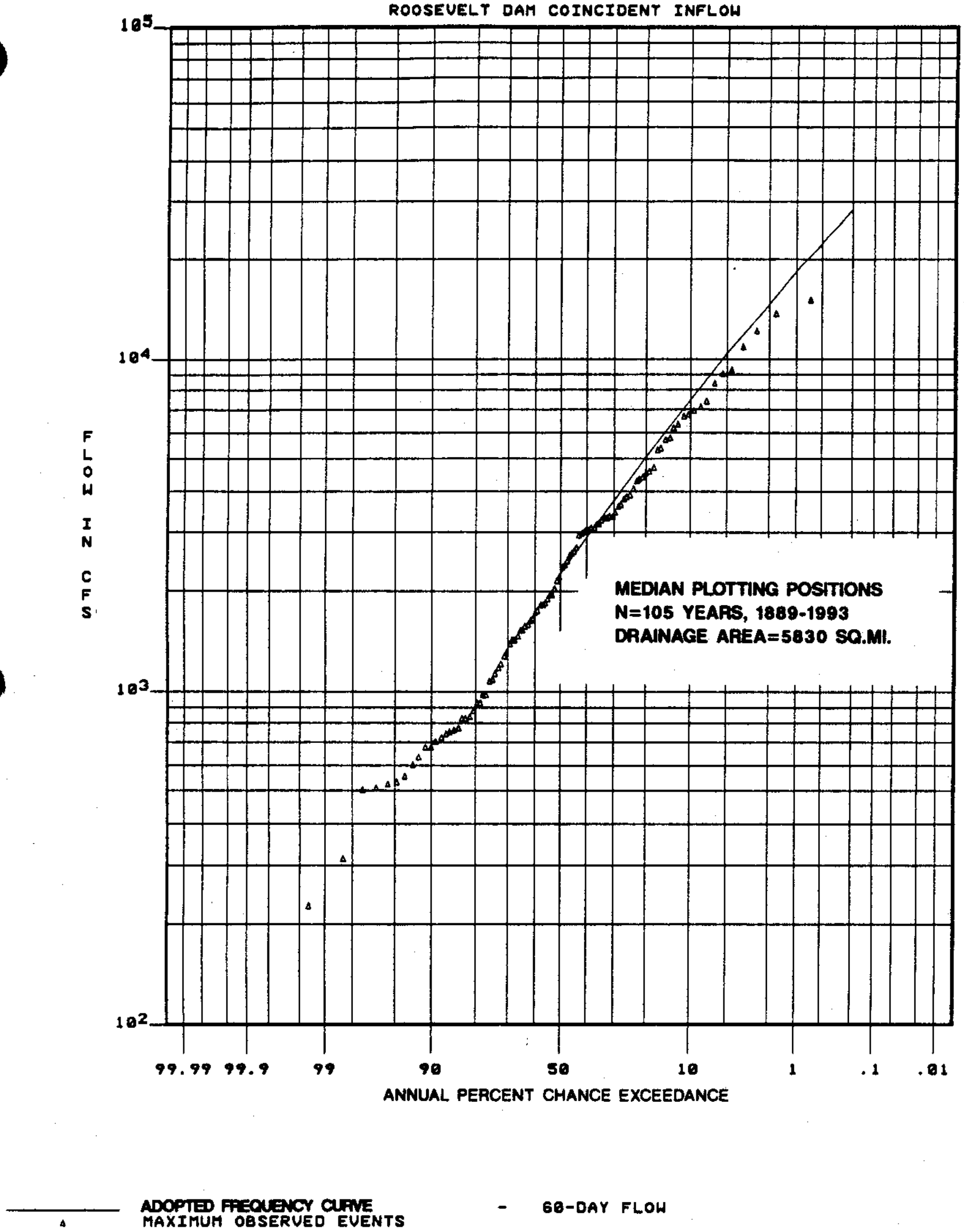

ROOSEVELT DAM COINCIDENT INFLOW
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5830 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE - 60-DAY FLOW
MAXIMUM OBSERVED EVENTS

FIGURE 7-9

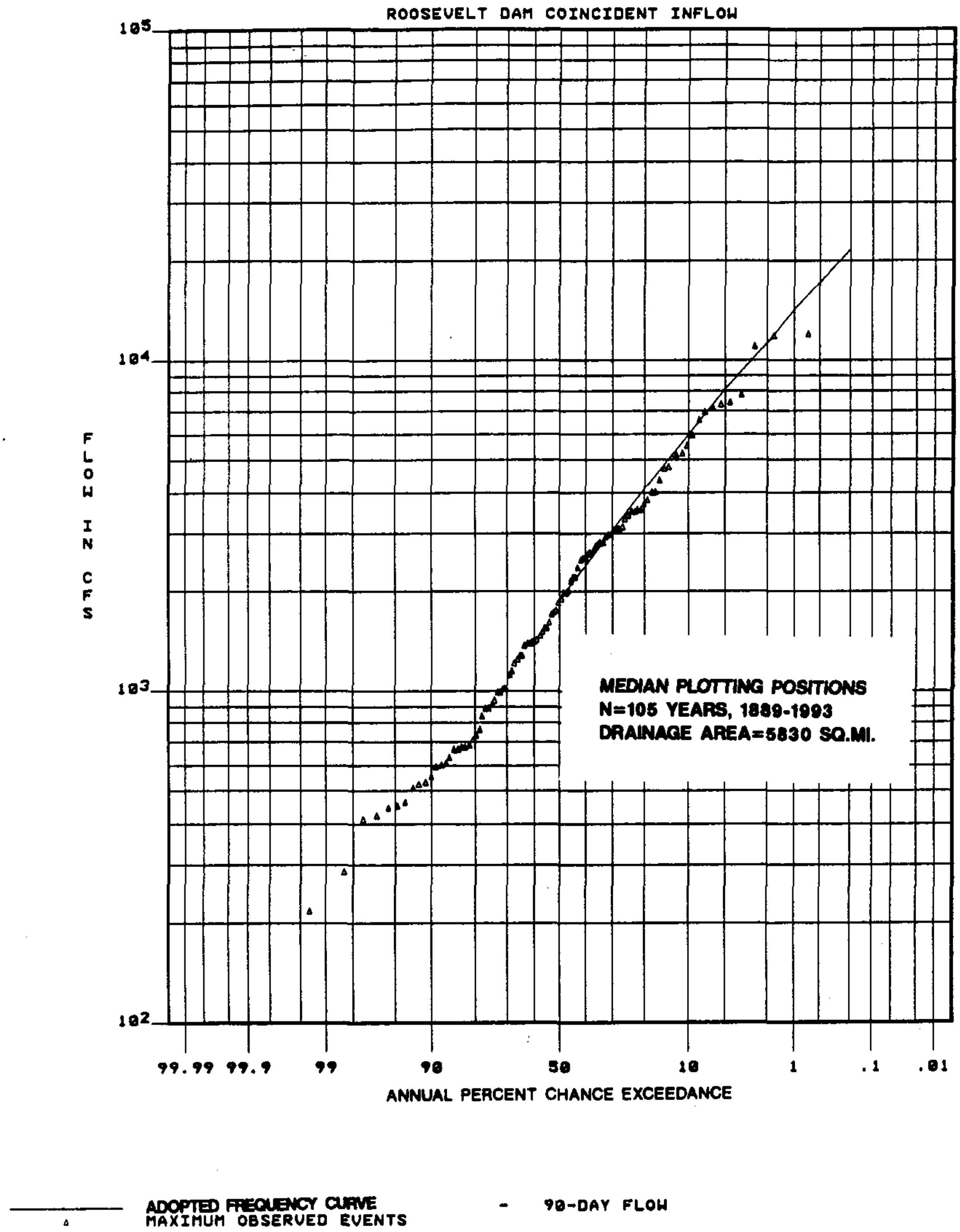
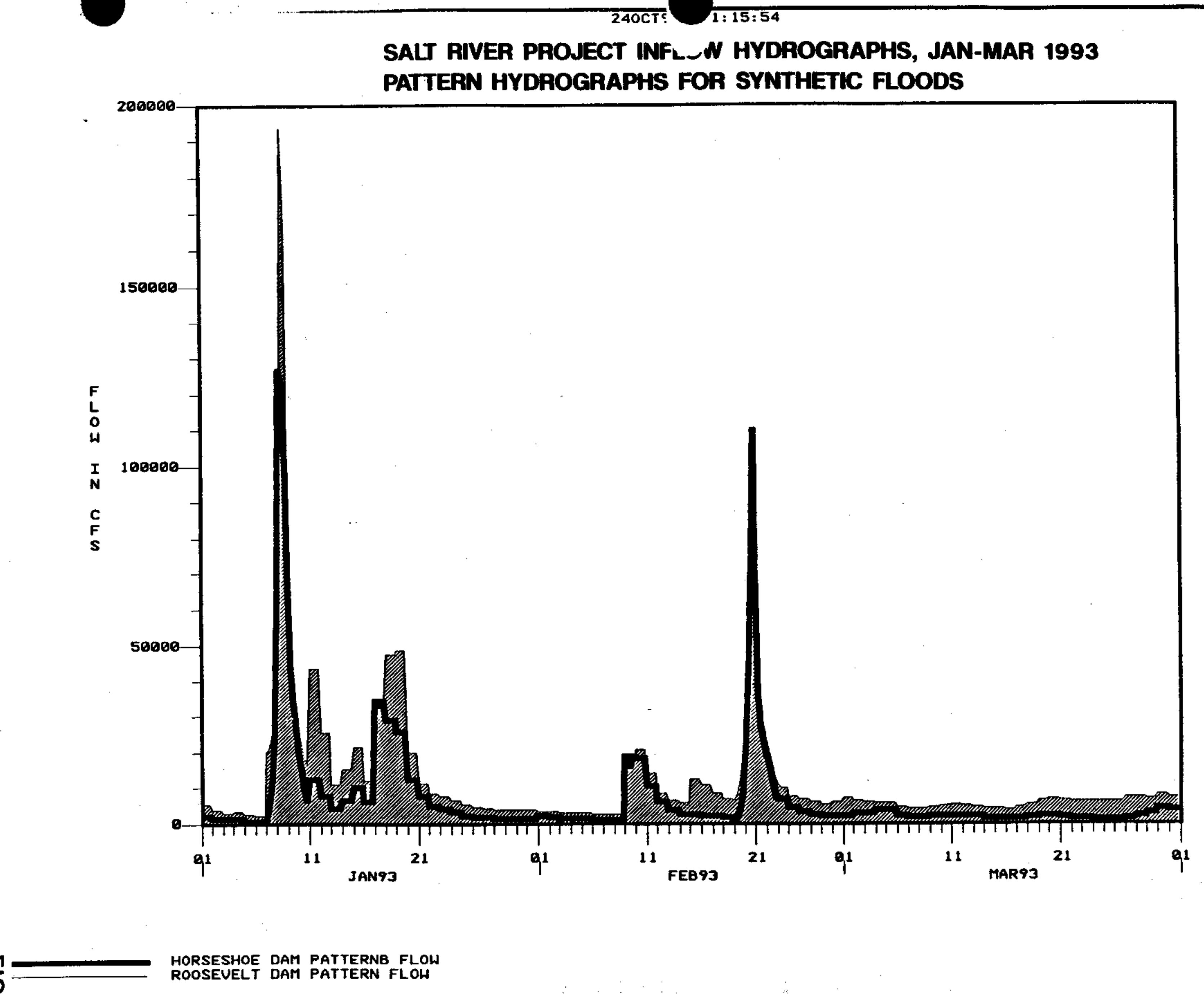

ROOSEVELT DAM COINCIDENT INFLOW
10^5
10^4
10^3
10^2
FLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5830 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE
MAXIMUM OBSERVED EVENTS
- 90-DAY FLOW

FIGURE 7-10



24OCT9? ?1:15:54
SALT RIVER PROJECT INFLOW HYDROGRAPHS, JAN-MAR 1993
PATTERN HYDROGRAPHS FOR SYNTHETIC FLOODS
200000
150000
100000
50000
0
FLOW IN CFS
01
11
21
01
11
21
01
11
21
01
JAN93
FEB93
MAR93
HORSESHOE DAM PATTERNB FLOW
ROOSEVELT DAM PATTERN FLOW

FIGURE 8

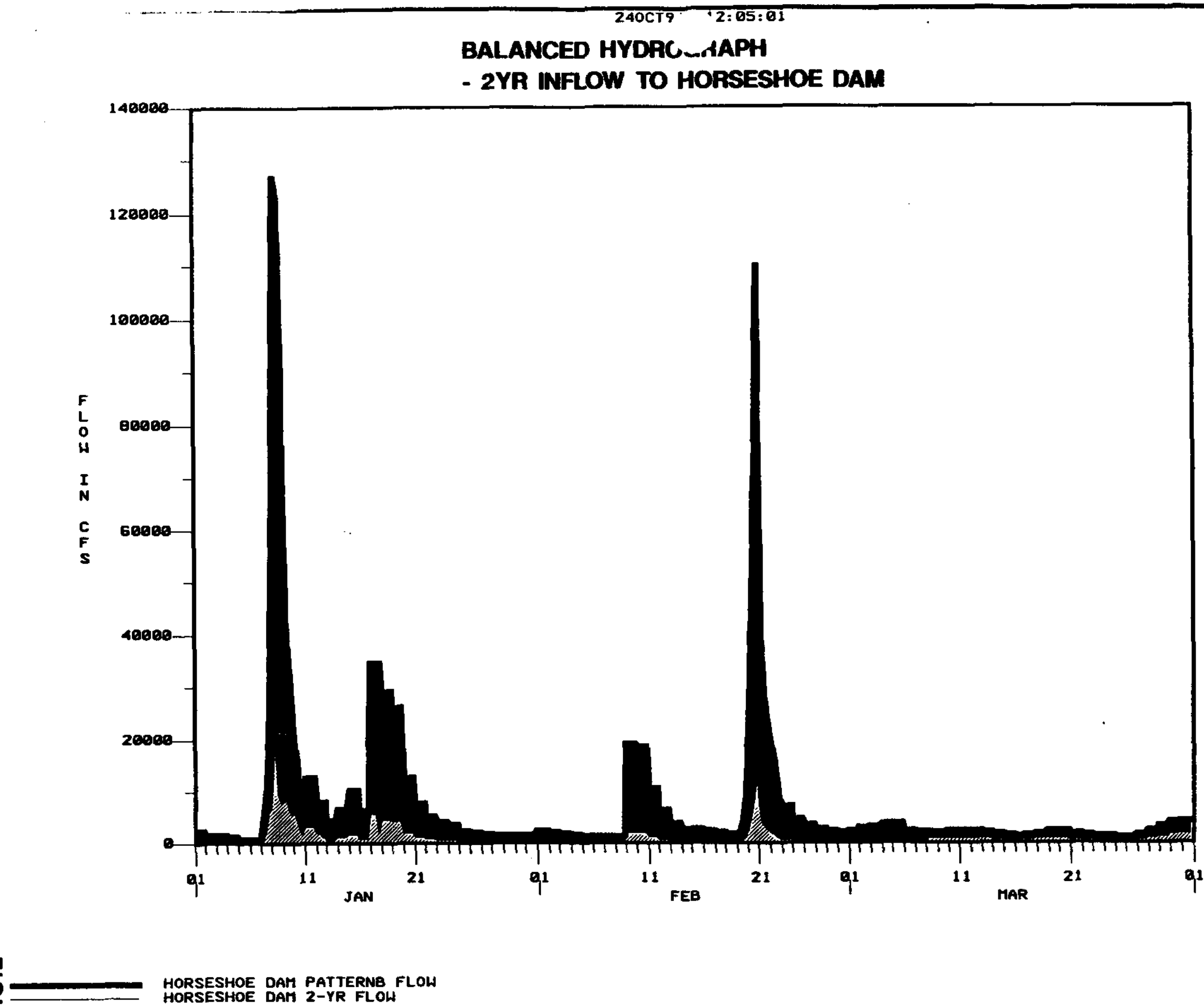

240CT9 '2:05:01
BALANCED HYDRO..APH
- 2YR INFLOW TO HORSESHOE DAM
FLOW IN CFS
140000
120000
100000
80000
60000
40000
20000
0
01
11
21
JAN
01
11
21
FEB
01
11
21
MAR
01
HORSESHOE DAM PATTERNB FLOW
HORSESHOE DAM 2-YR FLOW

FIGURE 9-1

24OCT9 2:10:02

BALANCED HYL GRAPH
- 5YR INFLOW TO HORSESHOE DAM

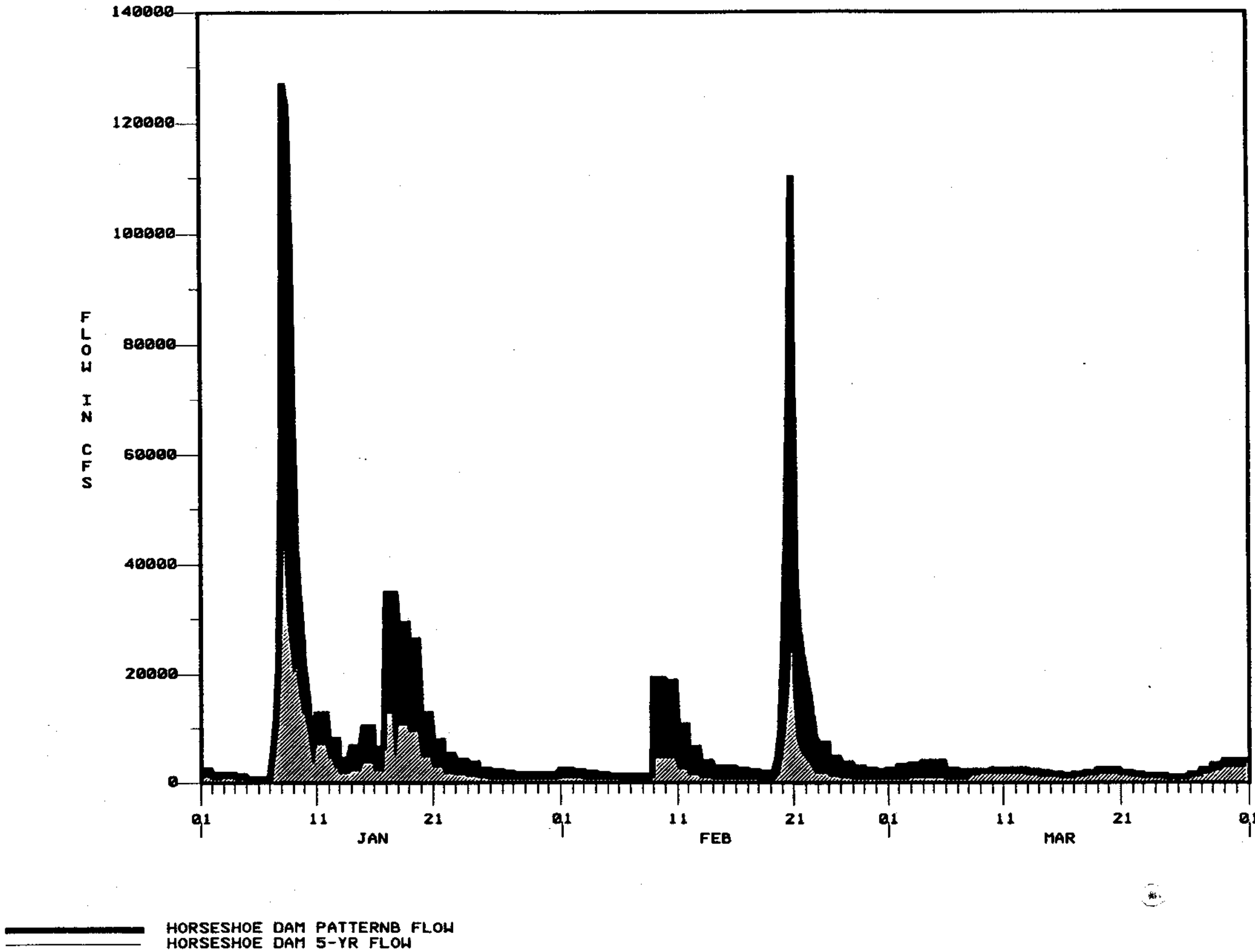


FIGURE 9-2

240CT9⁄ 12:59:05

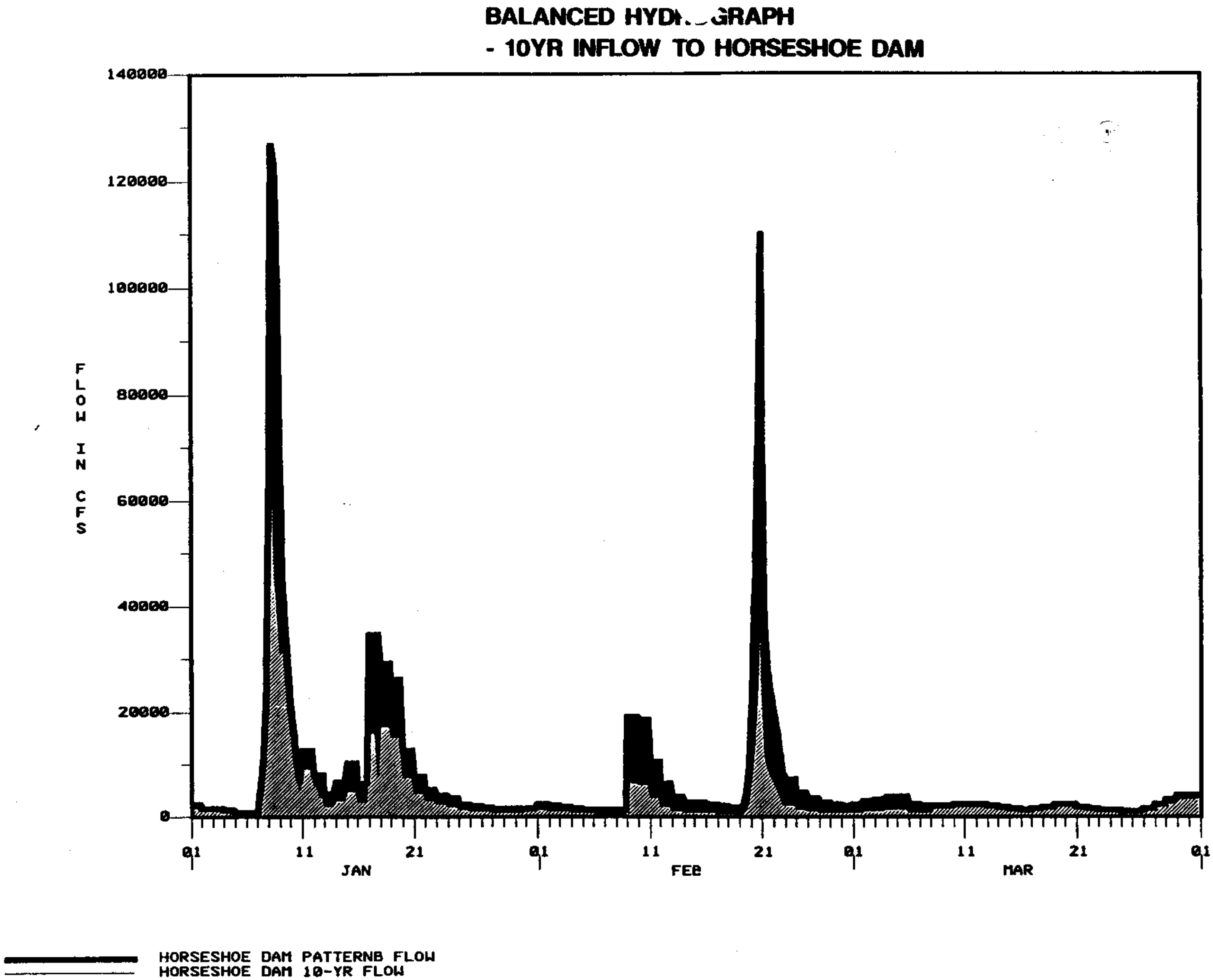


FIGURE 9-3

24OCT' 2:07:31

BALANCED HYDROGRAPH
- 20YR INFLOW TO HORSESHOE DAM

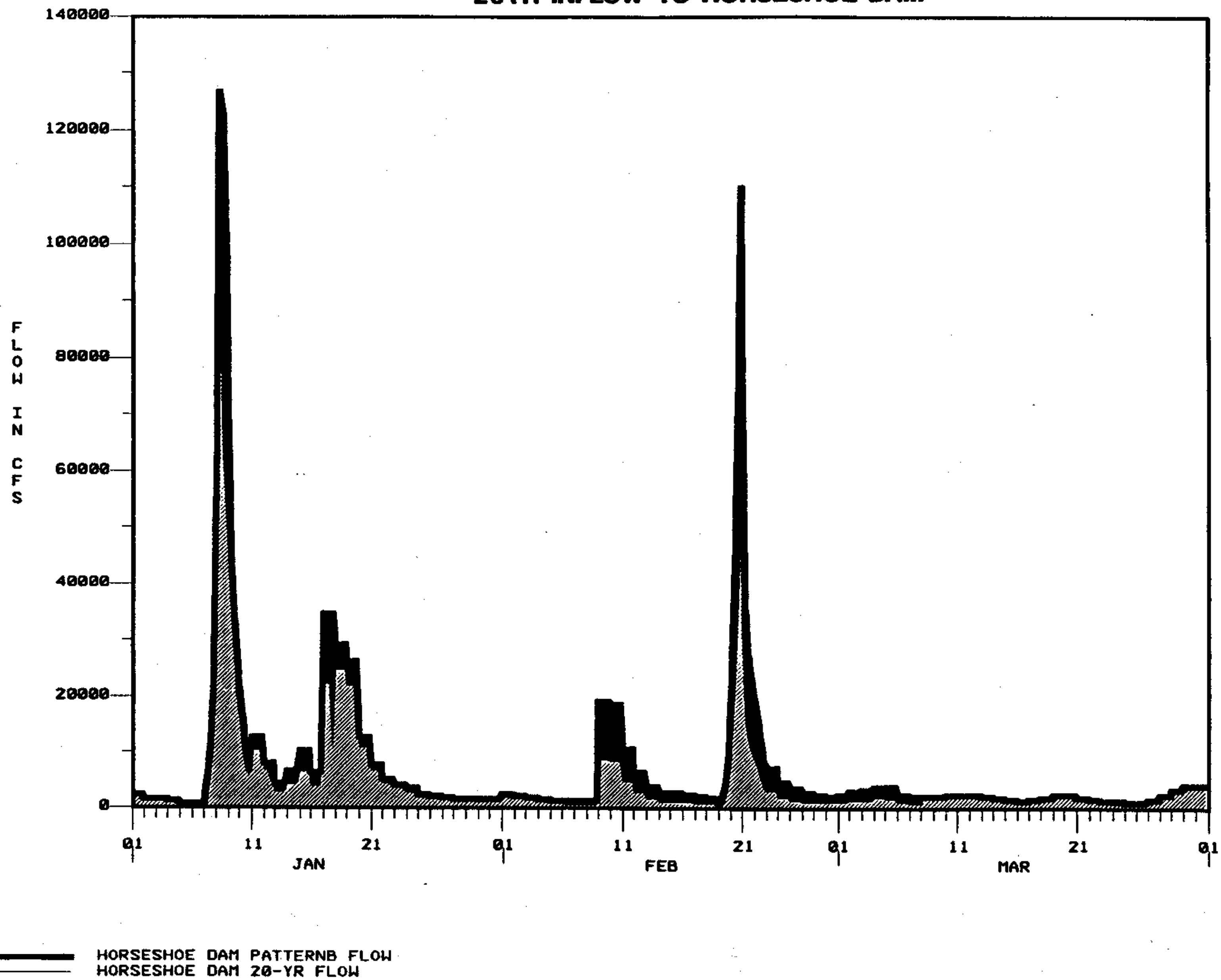
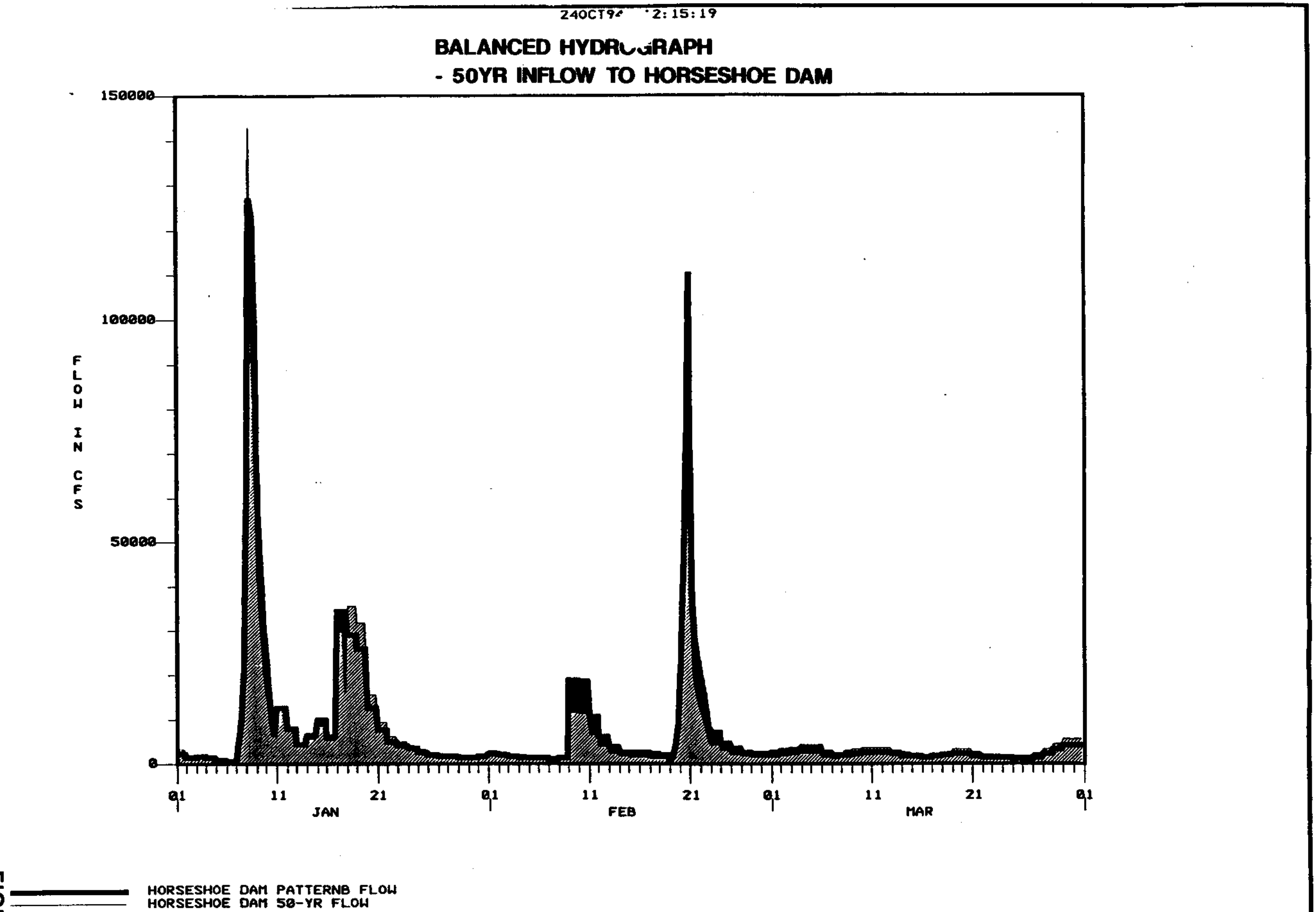


FIGURE 9-4



240CT94 2:15:19
BALANCED HYDROGRAPH
- 50YR INFLOW TO HORSESHOE DAM
150000
100000
50000
0
FLOW IN CFS
01
11
21
01
11
21
01
11
21
01
JAN
FEB
MAR
HORSESHOE DAM PATTERNB FLOW
HORSESHOE DAM 50-YR FLOW

FIGURE 9-5

24OCT [illegible] 2:02:41

BALANCED HYDROGRAPH
- 100YR INFLOW TO HORSESHOE DAM

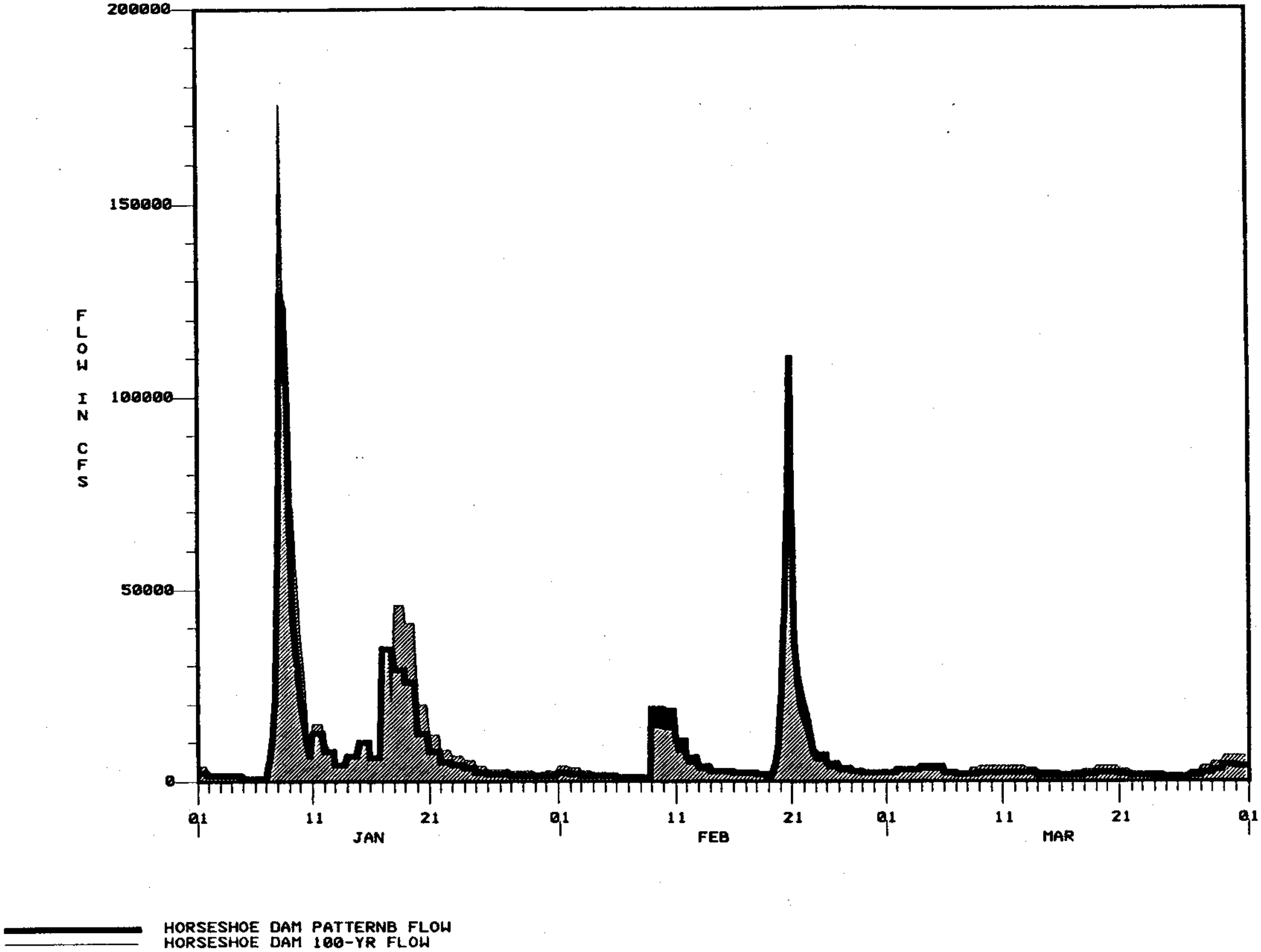


FIGURE 9-6

24OCT9' '3:05:08

BALANCED HYL..OGRAPH
- 200YR INFLOW TO HORSESHOE DAM

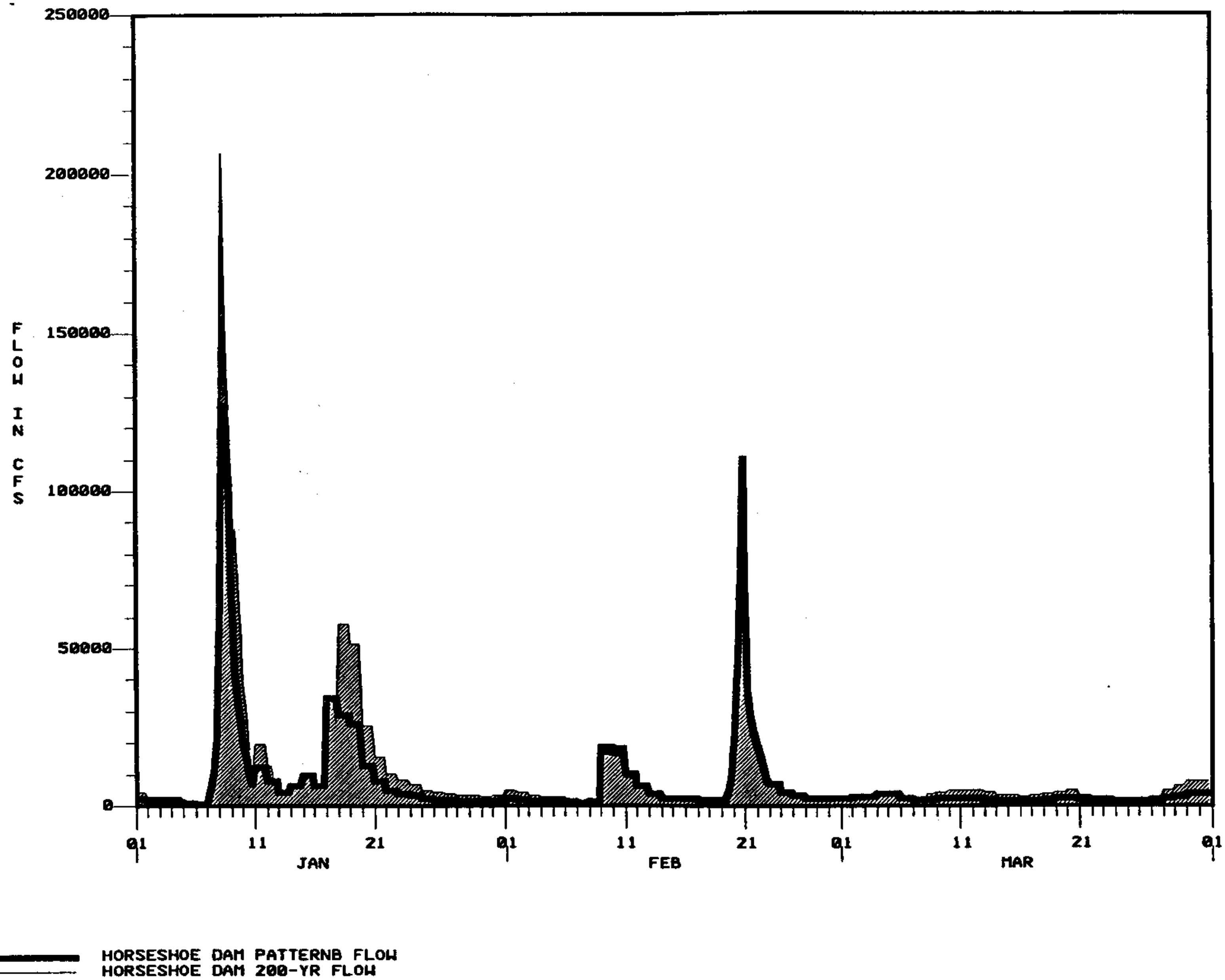


FIGURE 9-7

240CT 2:17:30

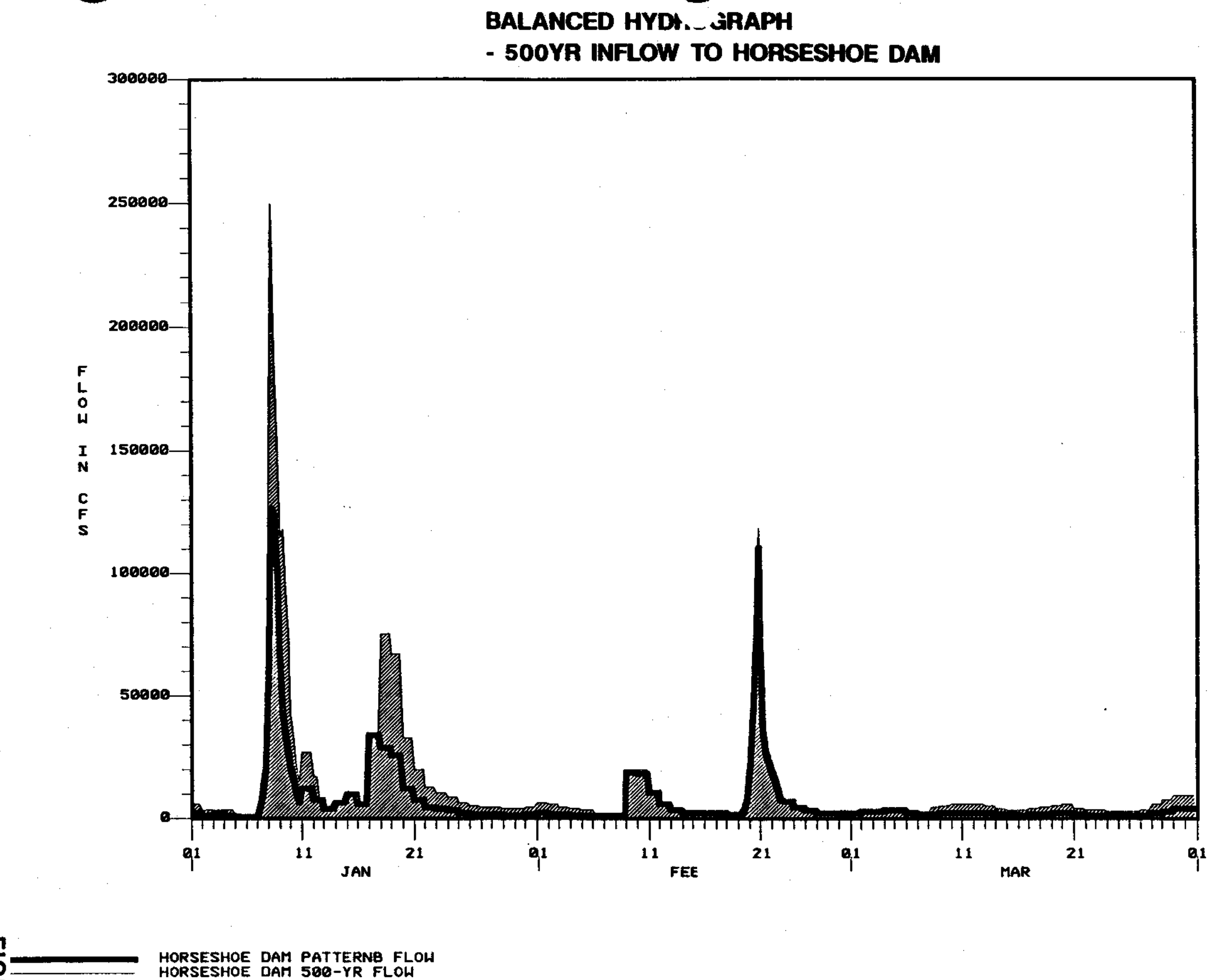


FIGURE 9-8

24OCT94 11:30:34

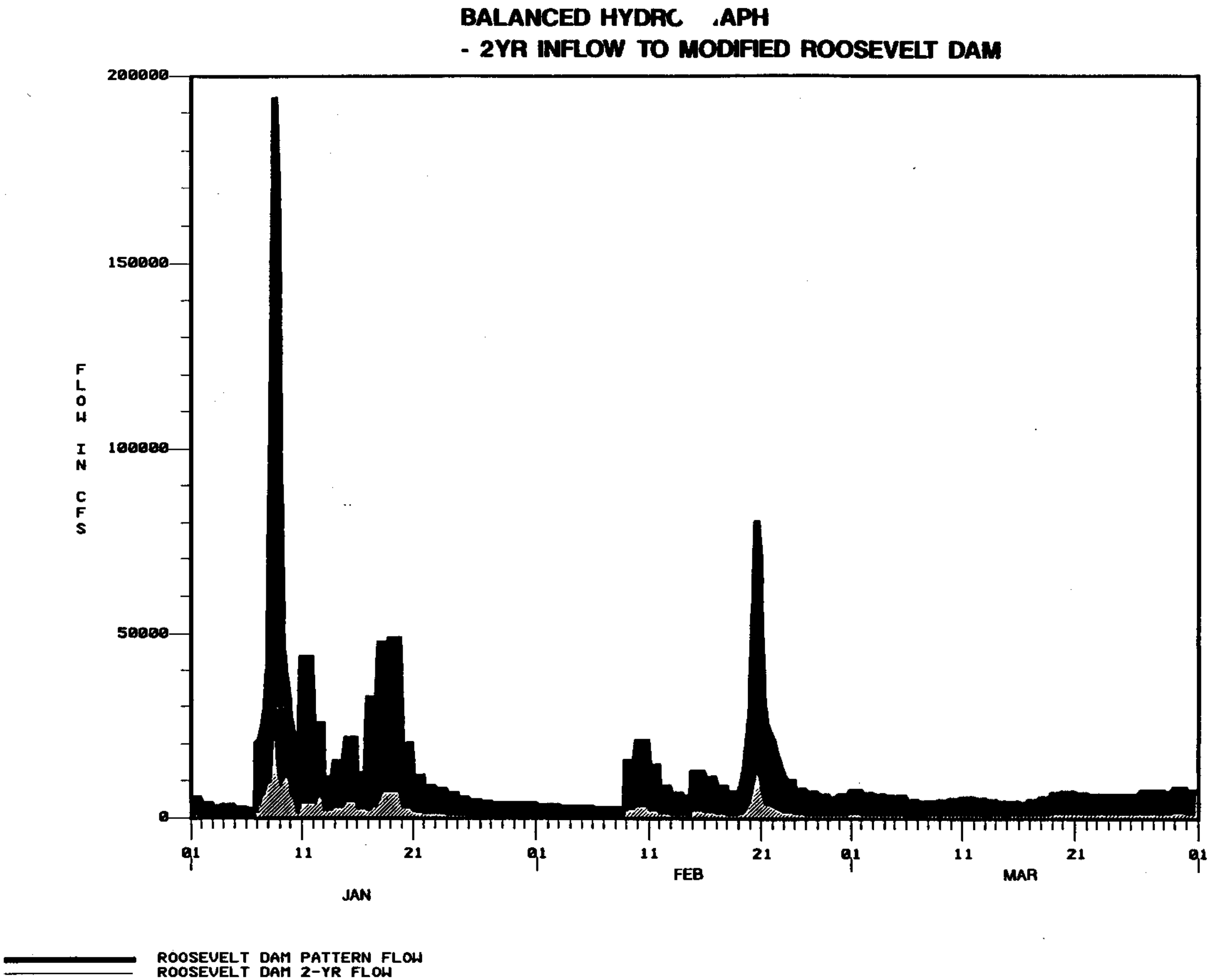


FIGURE 10-1

240CT9 1:51:47

BALANCED HYDROGRAPH
- 5YR INFLOW TO MODIFIED ROOSEVELT DAM

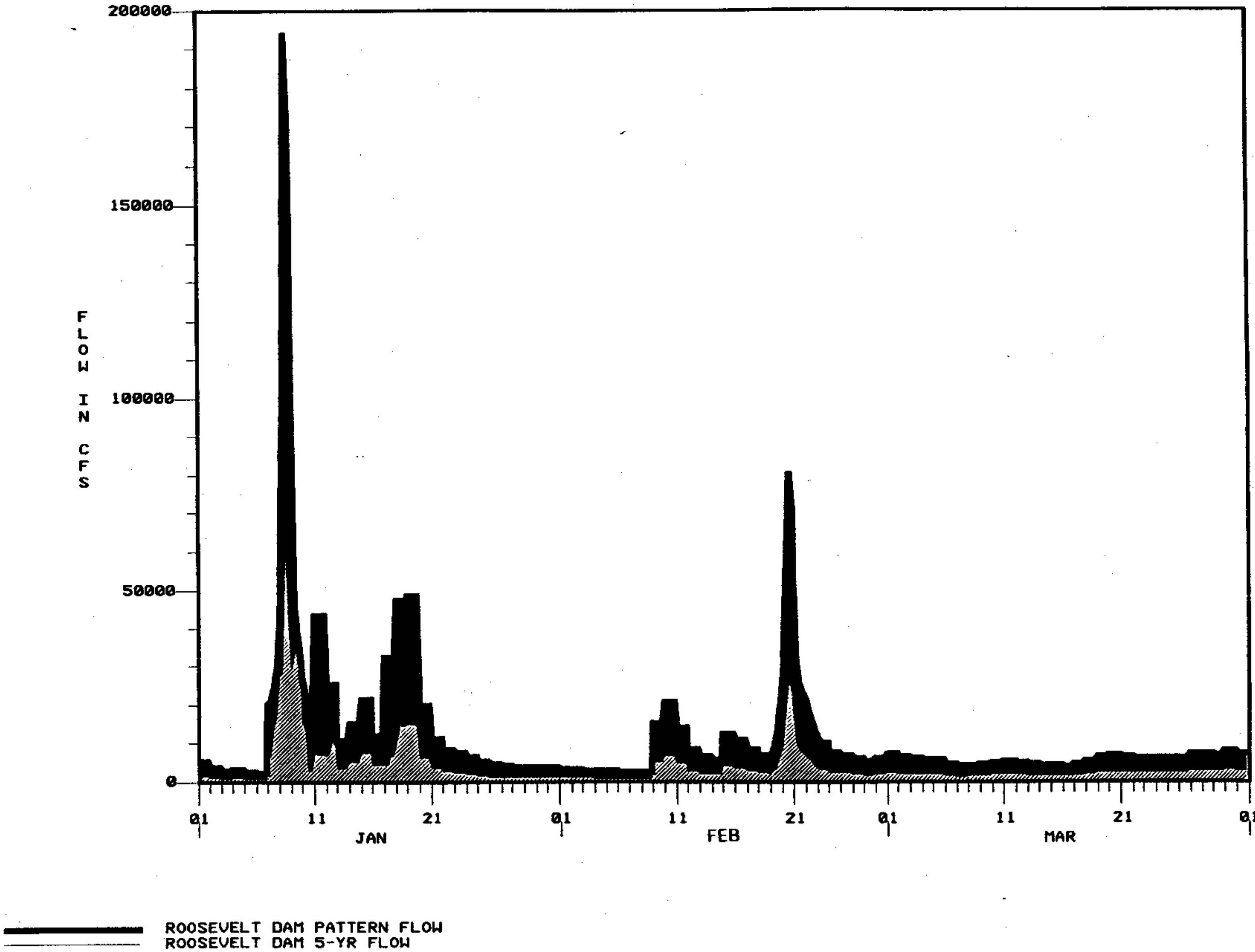
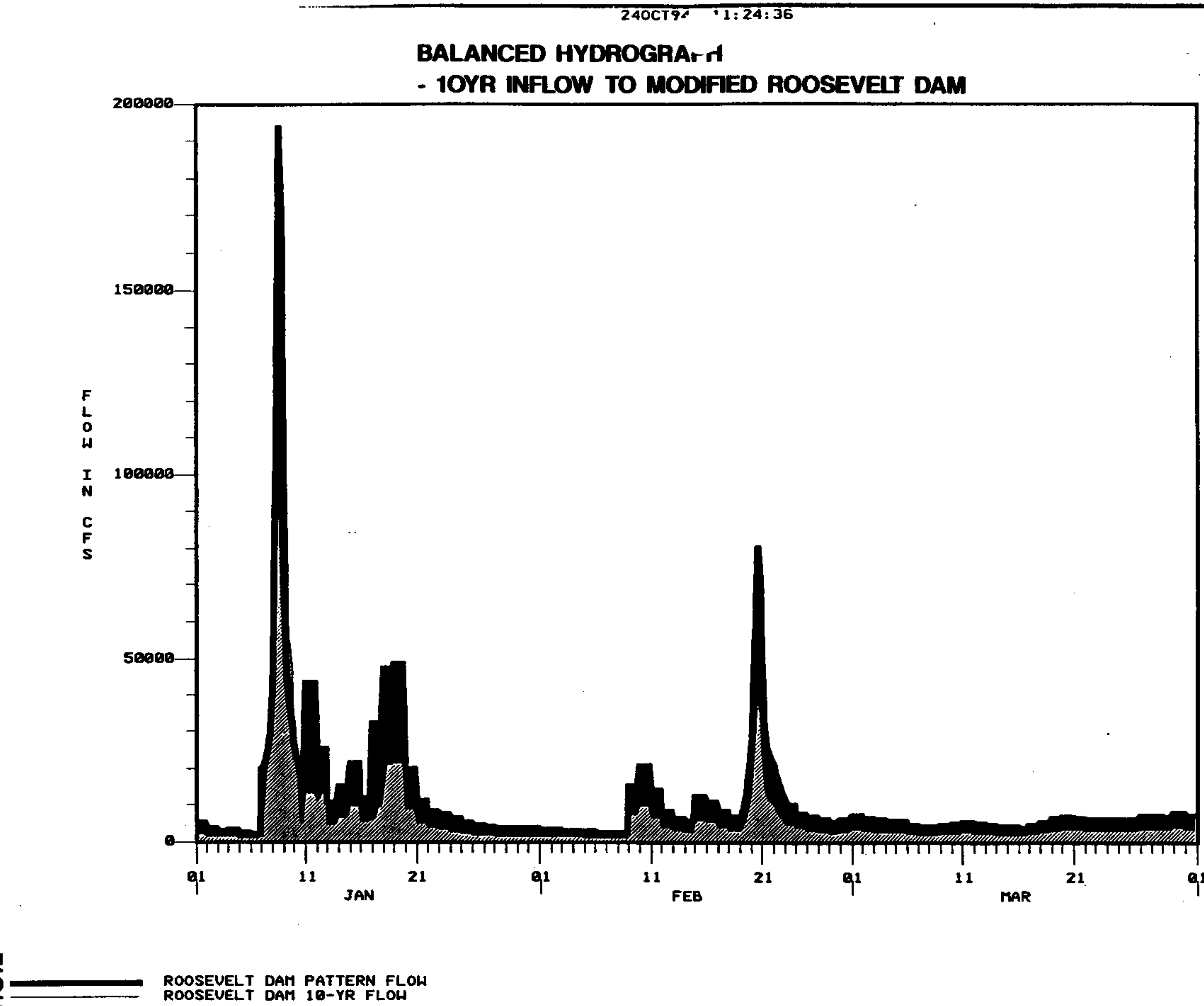


FIGURE 10-2



240CT94 11:24:36
BALANCED HYDROGRAPH
- 10YR INFLOW TO MODIFIED ROOSEVELT DAM
200000
150000
100000
50000
0
FLOW IN CFS
01
11
21
JAN
FEB
MAR
ROOSEVELT DAM PATTERN FLOW
ROOSEVELT DAM 10-YR FLOW

FIGURE 10-3

24OCT9 1:40:31

BALANCED HYDROGRAPH
- 20YR INFLOW TO MODIFIED ROOSEVELT DAM

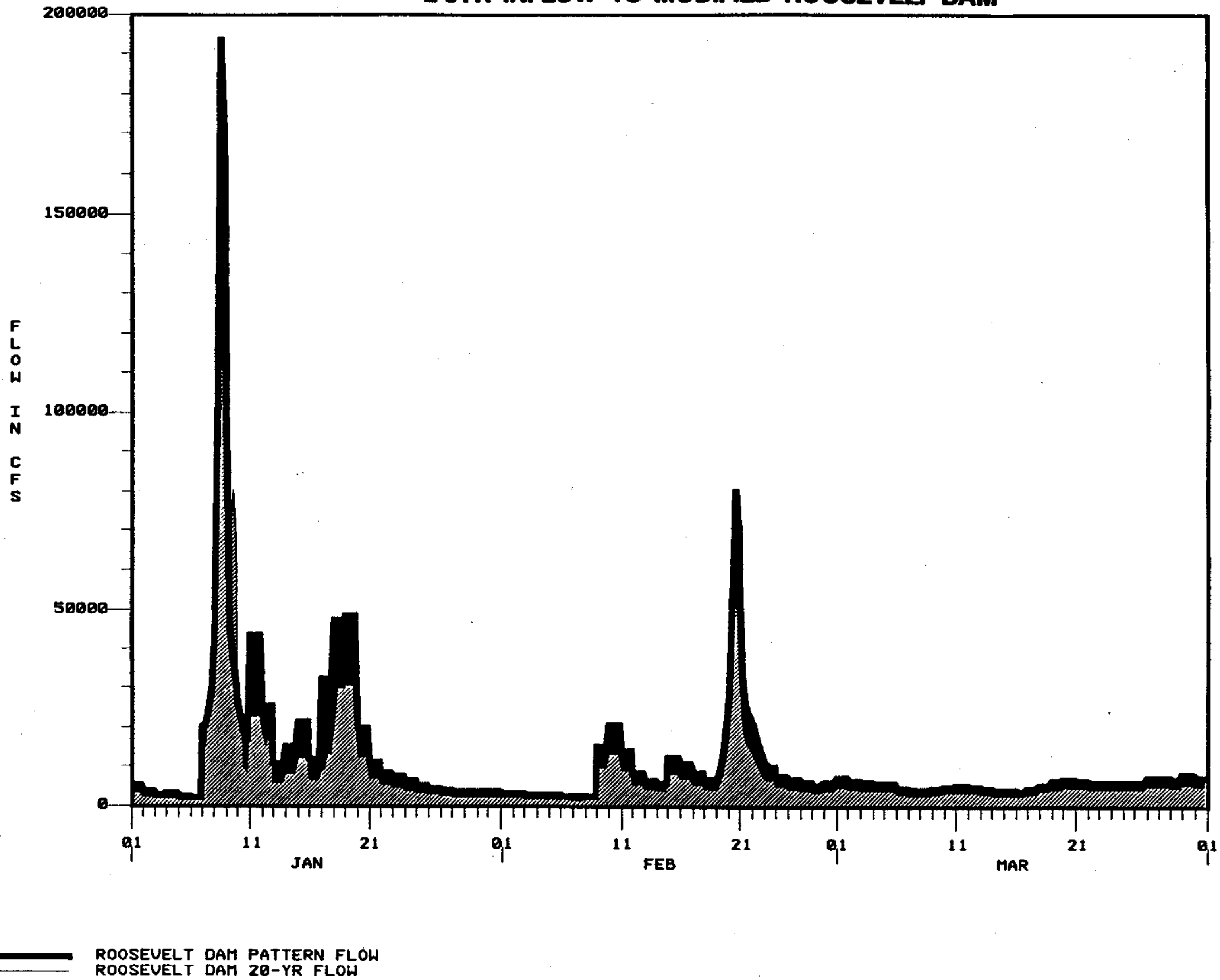


FIGURE 10-4

240CT9⁄ '1:54:21

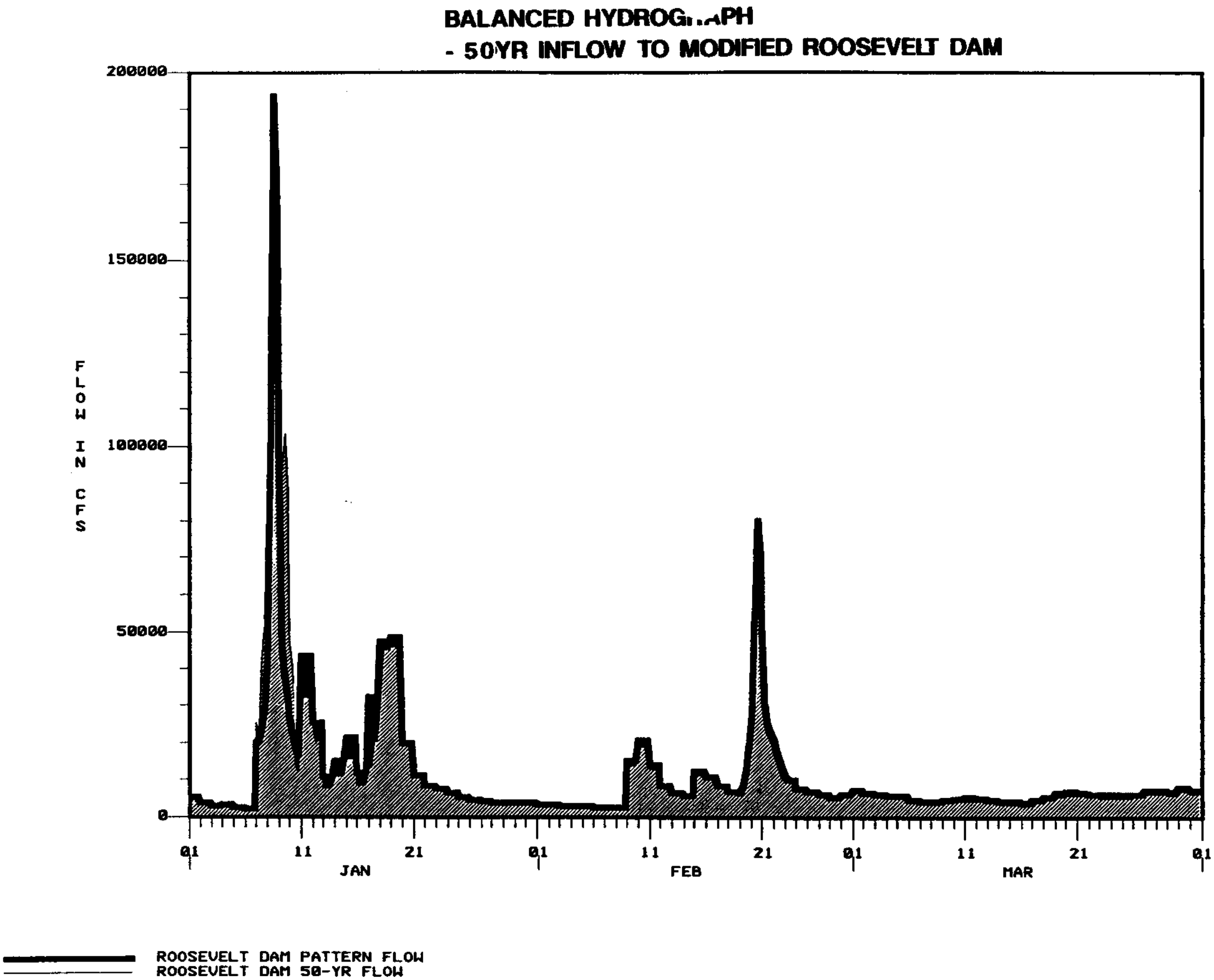


FIGURE 10-5

240CT 1:33:29

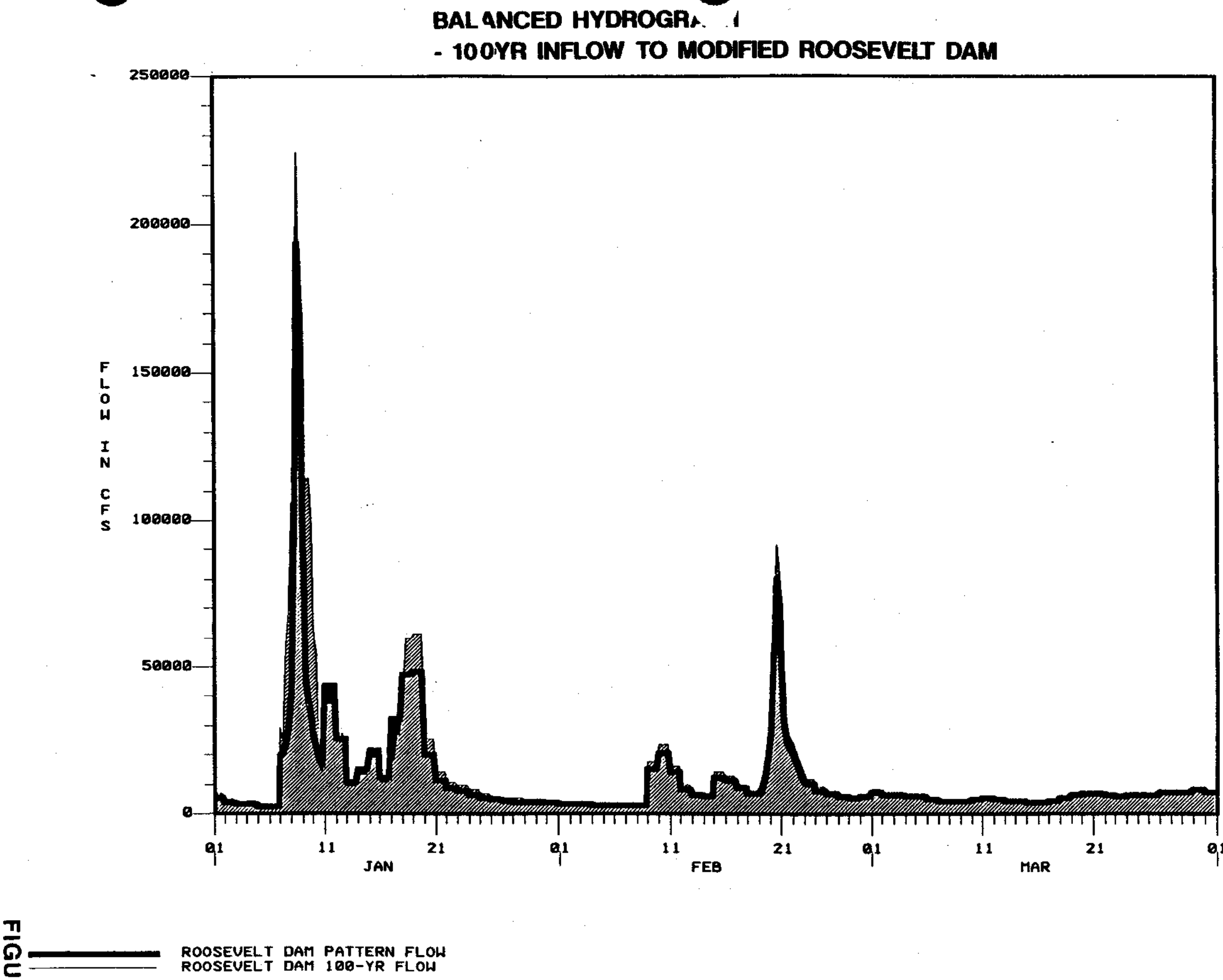


FIGURE 10-6

BALANCED HYDROGRAPH
- 200YR INFLOW TO MODIFIED ROOSEVELT DAM

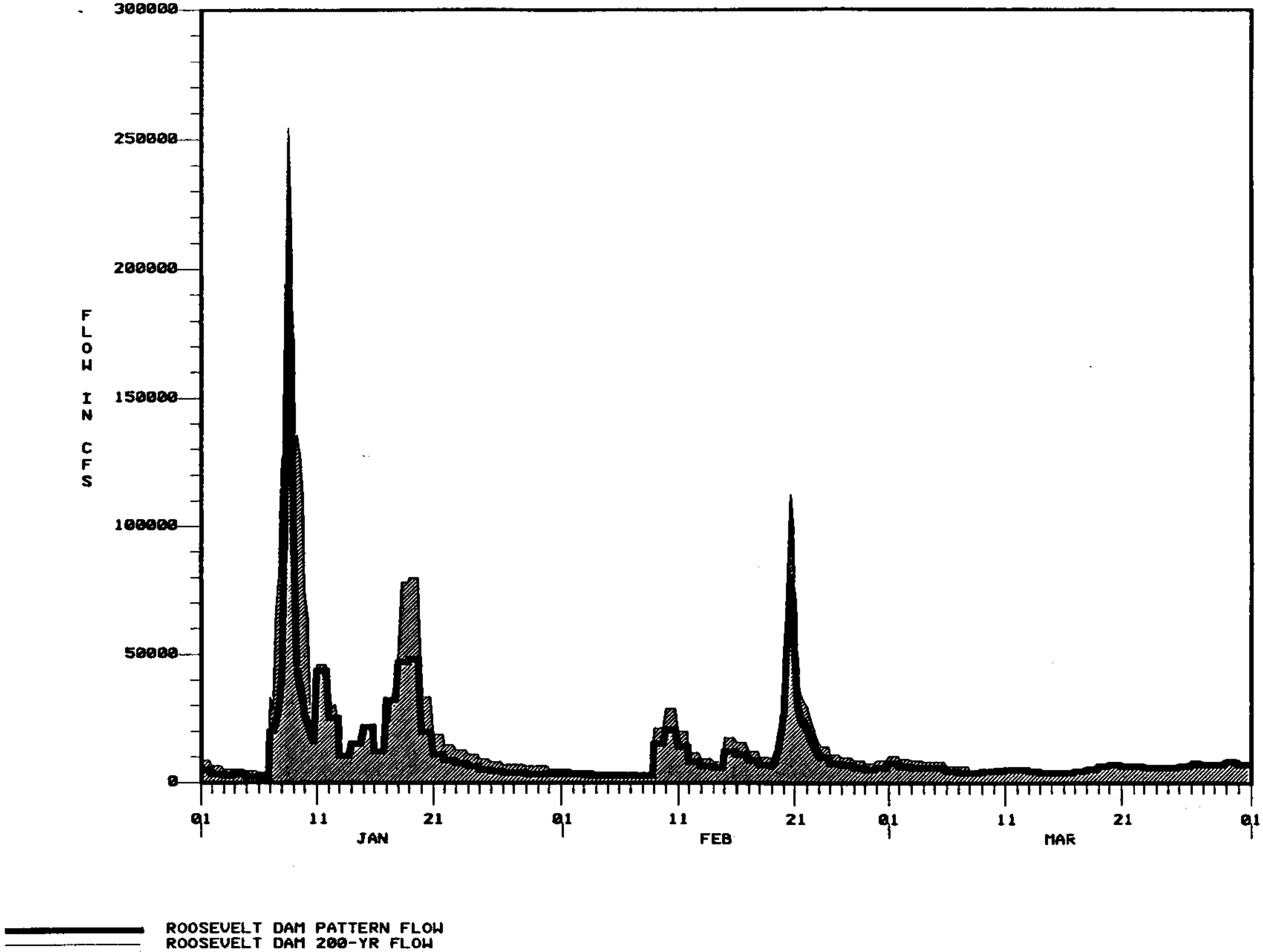


FIGURE 10-7

BALANCED HYDROGRAP

- 500YR INFLOW TO MODIFIED ROOSEVELT DAM

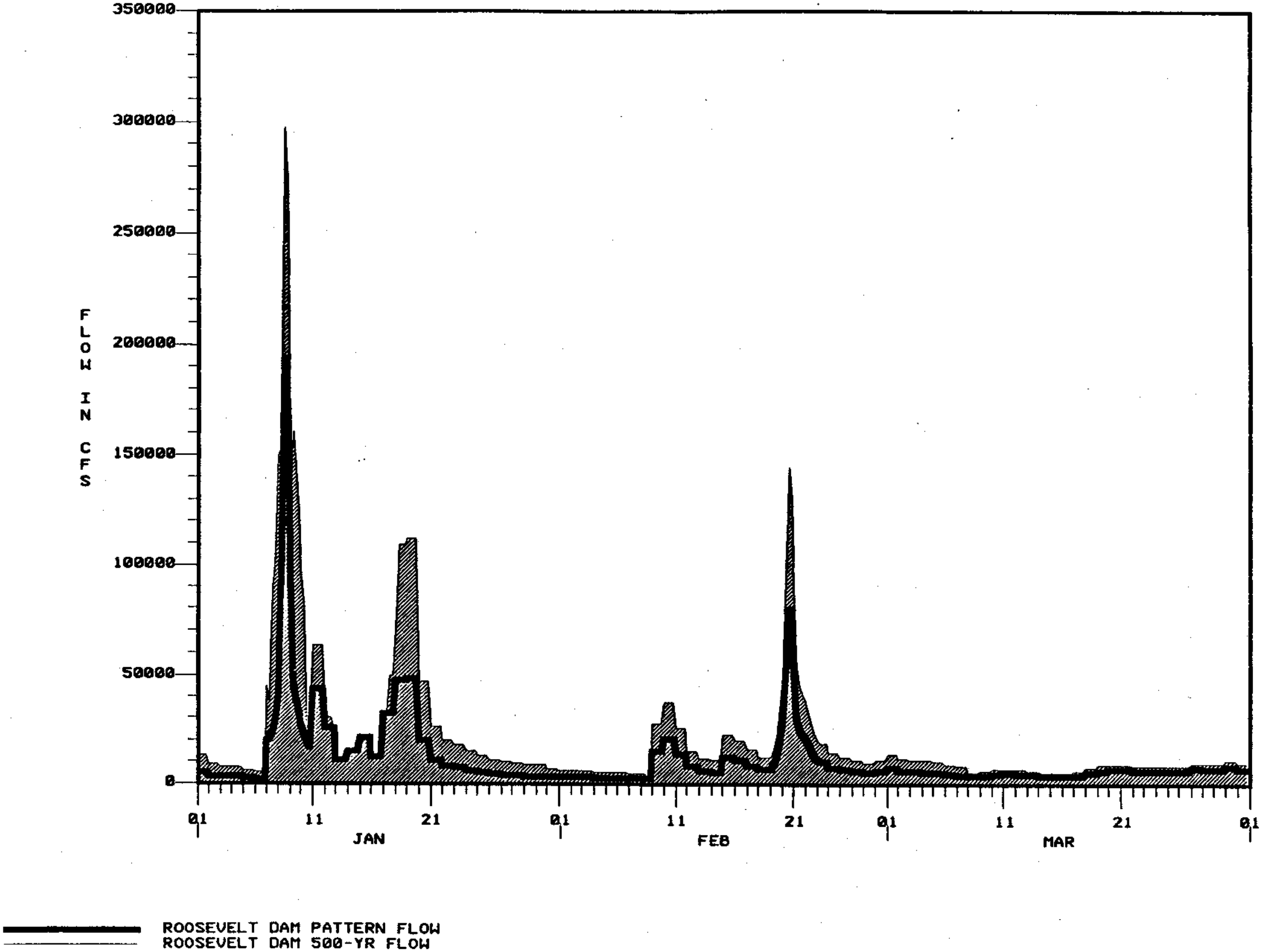


FIGURE 10-8

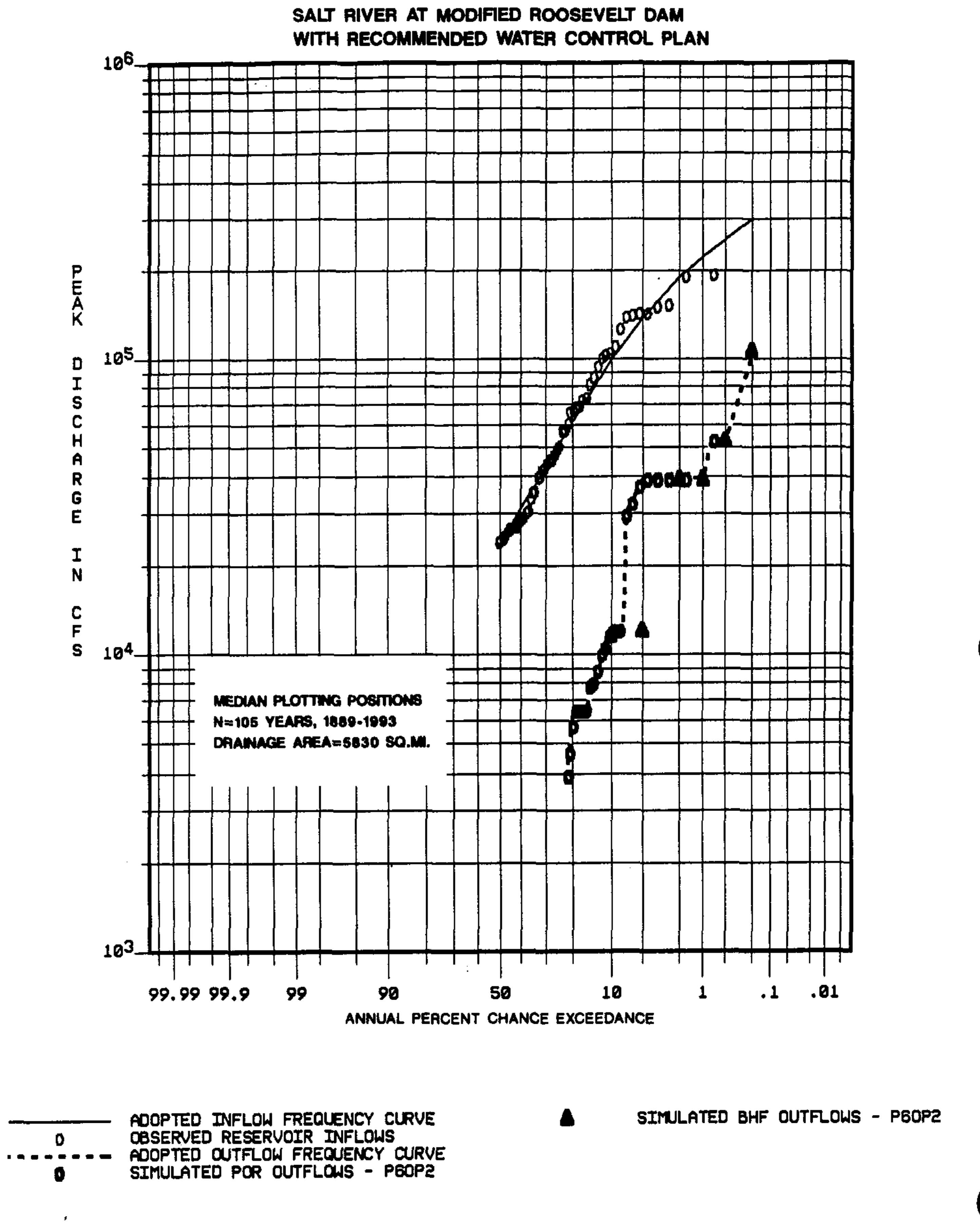

SALT RIVER AT MODIFIED ROOSEVELT DAM
WITH RECOMMENDED WATER CONTROL PLAN
PEAK DISCHARGE IN CFS
10^6
10^5
10^4
10^3
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5830 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED INFLOW FREQUENCY CURVE
0 OBSERVED RESERVOIR INFLOWS
ADOPTED OUTFLOW FREQUENCY CURVE
0 SIMULATED POR OUTFLOWS - P60P2
▲ SIMULATED BHF OUTFLOWS - P60P2

FIGURE 11

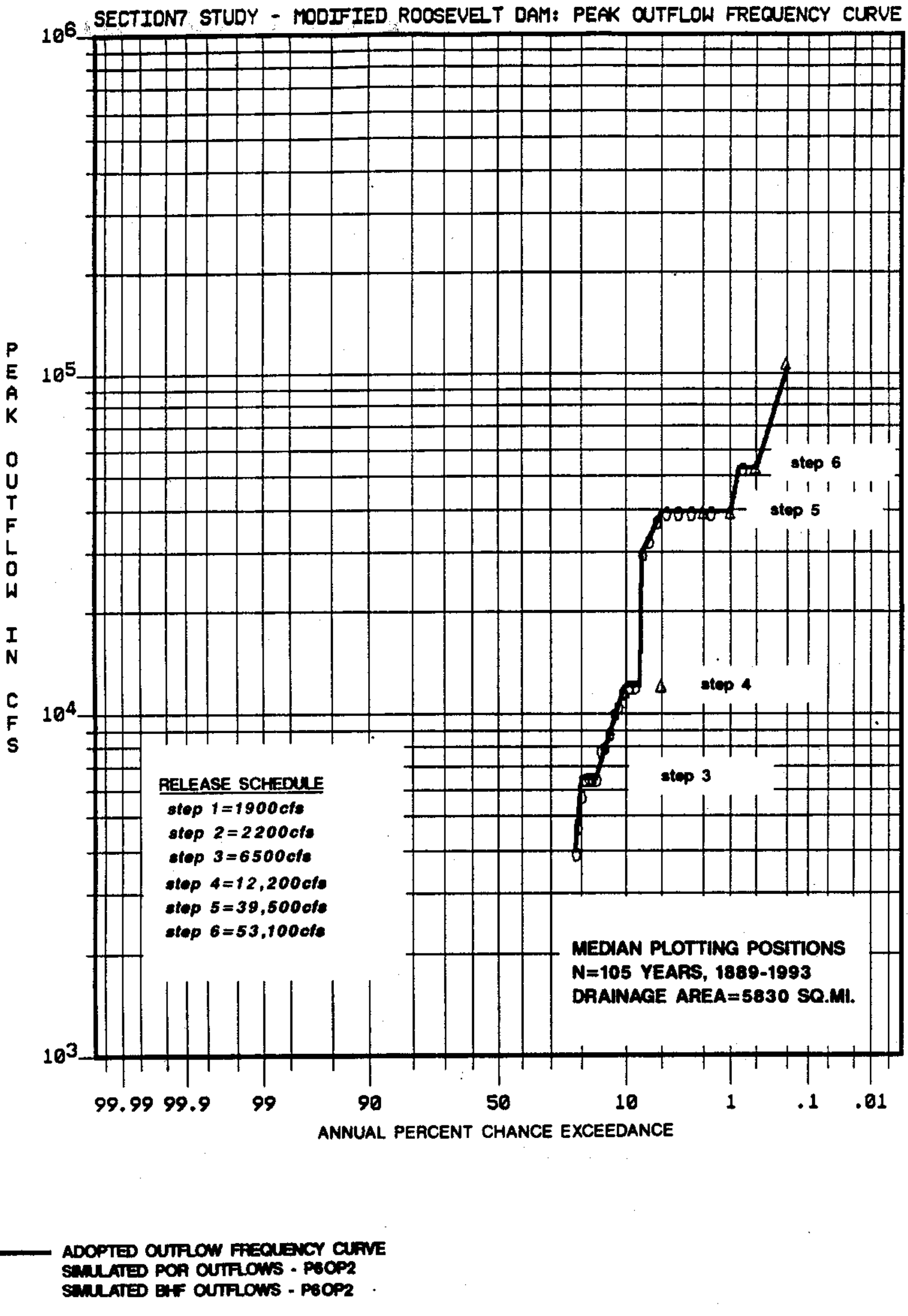

SECTION7 STUDY - MODIFIED ROOSEVELT DAM: PEAK OUTFLOW FREQUENCY CURVE
10^6
10^5
10^4
10^3
PEAK OUTFLOW IN CFS
step 6
step 5
step 4
step 3
RELEASE SCHEDULE
step 1=1900cfs
step 2=2200cfs
step 3=6500cfs
step 4=12,200cfs
step 5=39,500cfs
step 6=53,100cfs
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5830 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED OUTFLOW FREQUENCY CURVE
0 SIMULATED POR OUTFLOWS - P6OP2
Δ SIMULATED BHF OUTFLOWS - P6OP2

FIGURE 12

15JUN9 7:57:15

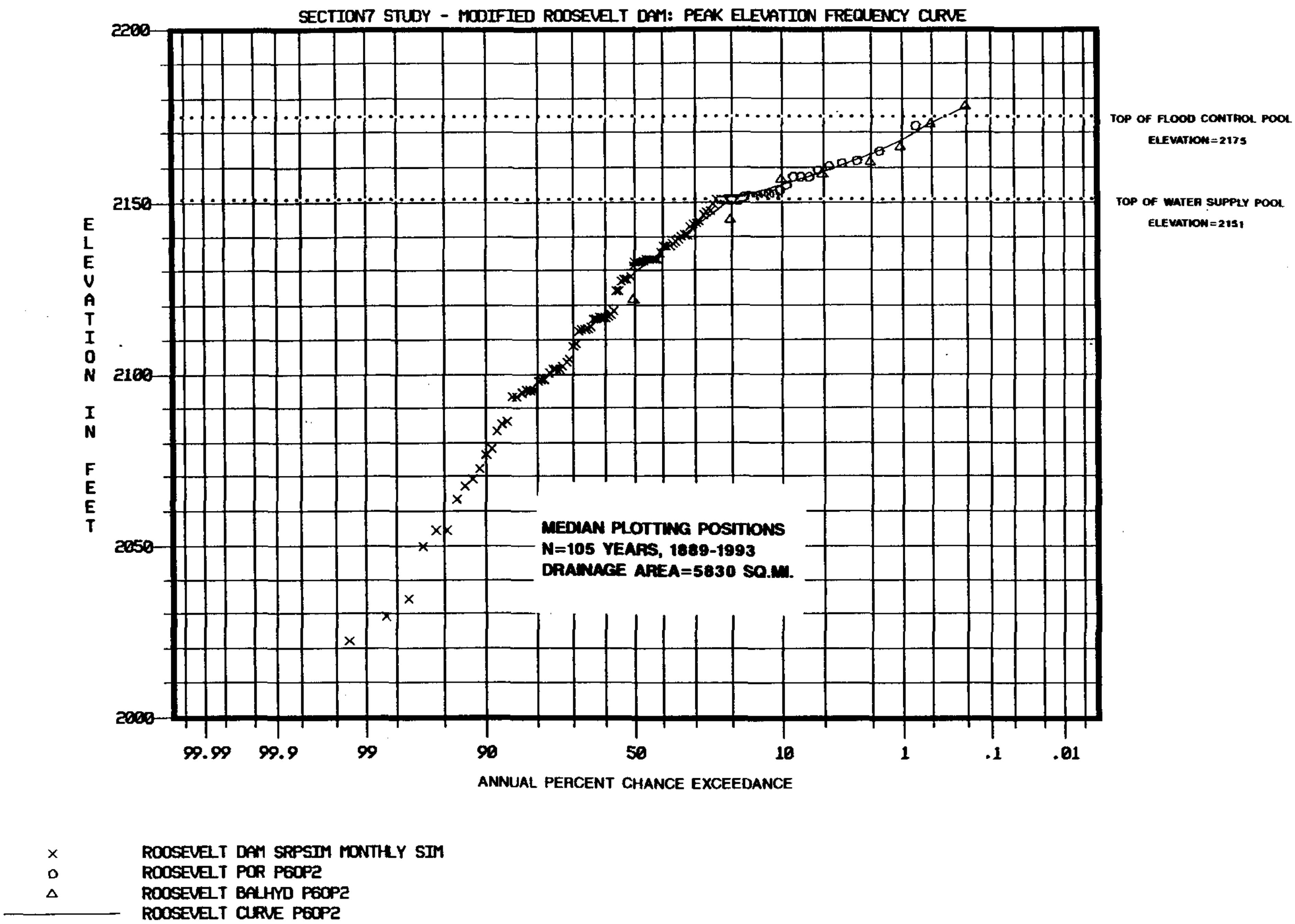


FIGURE 13

15JUN95 15:27:58

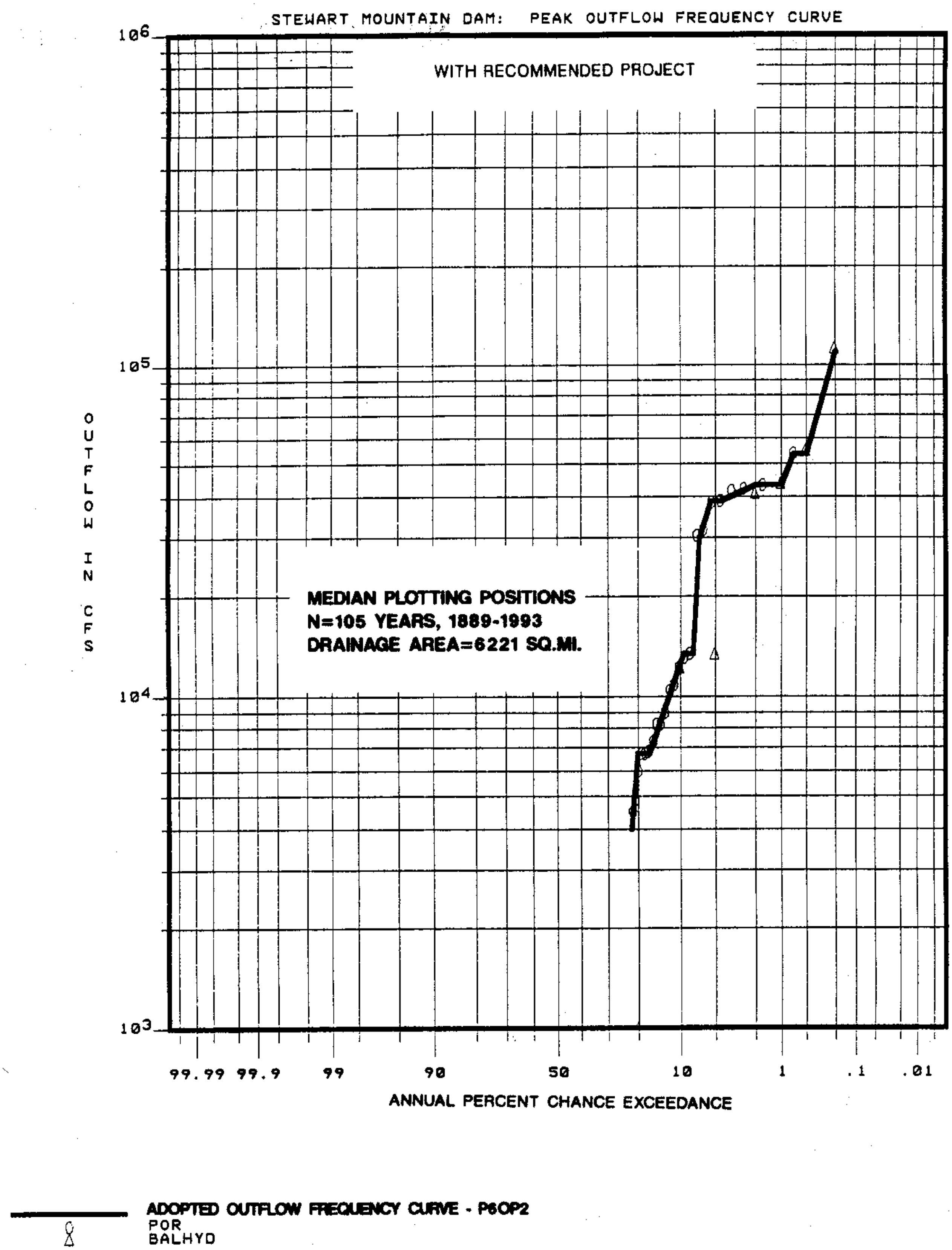


FIGURE 14-1

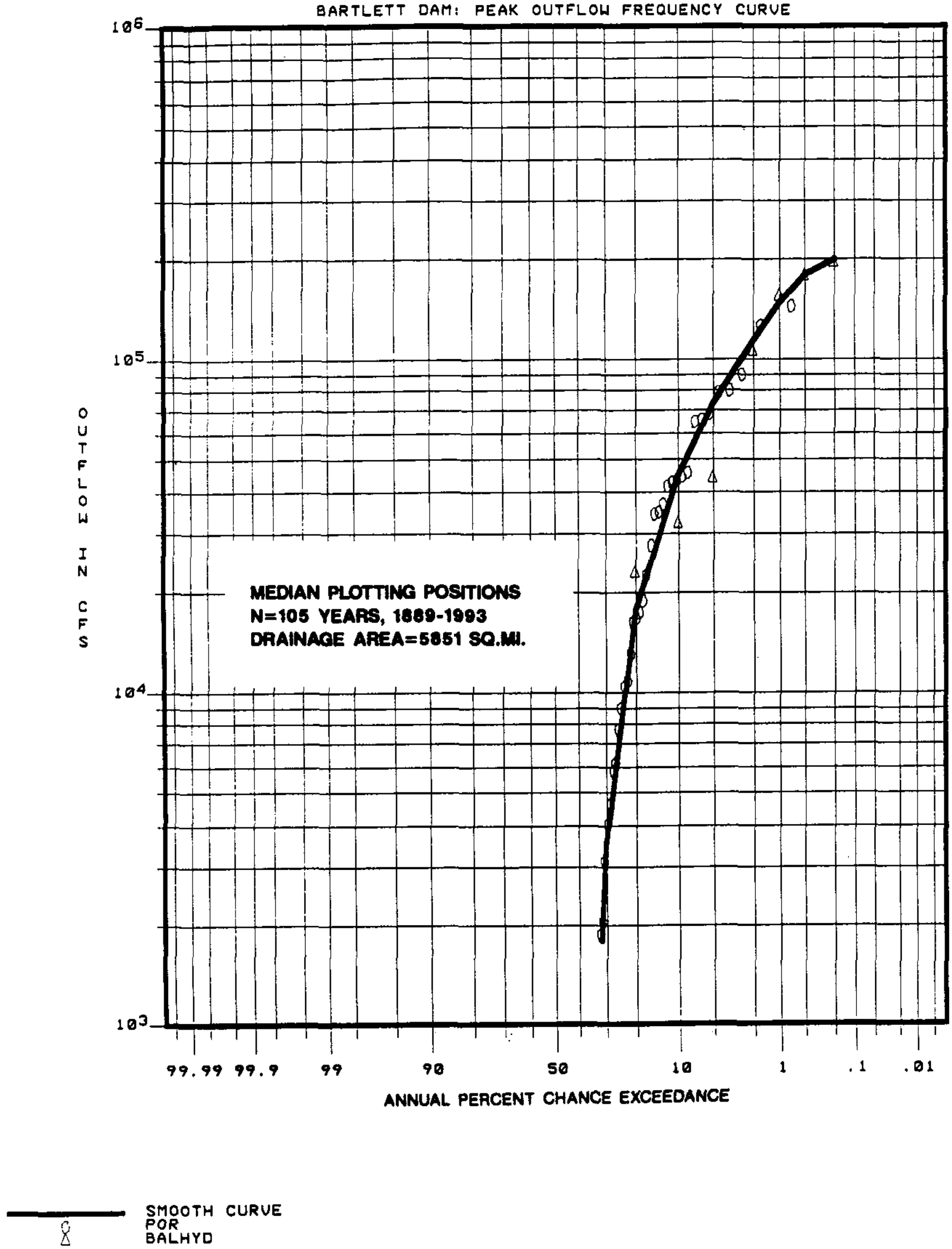

BARTLETT DAM: PEAK OUTFLOW FREQUENCY CURVE
10^6
10^5
10^4
10^3
OUTFLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5851 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
SMOOTH CURVE
POR
BALHYD

FIGURE 14-2

16JUN95 11:23:27

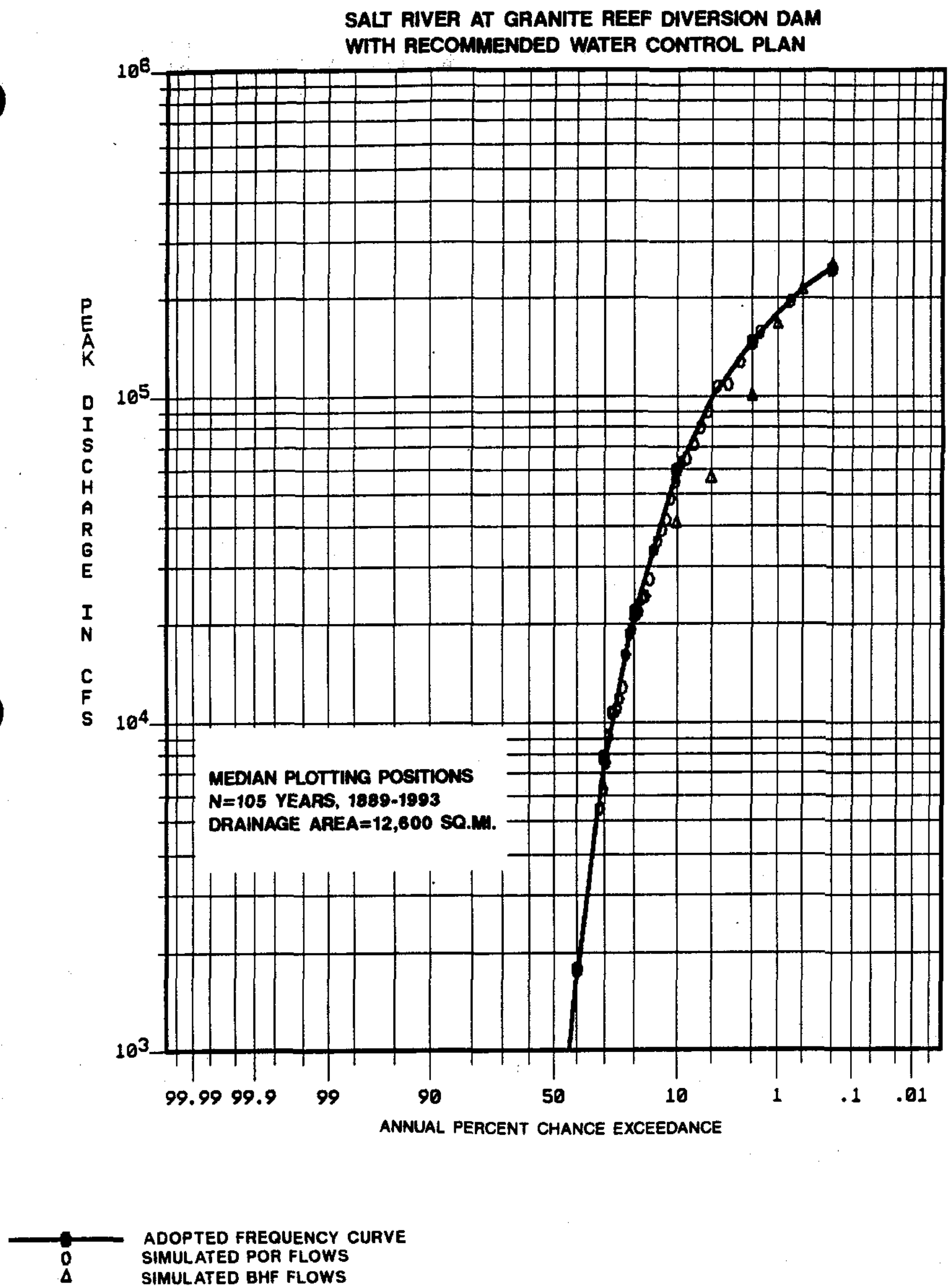


FIGURE 15-1

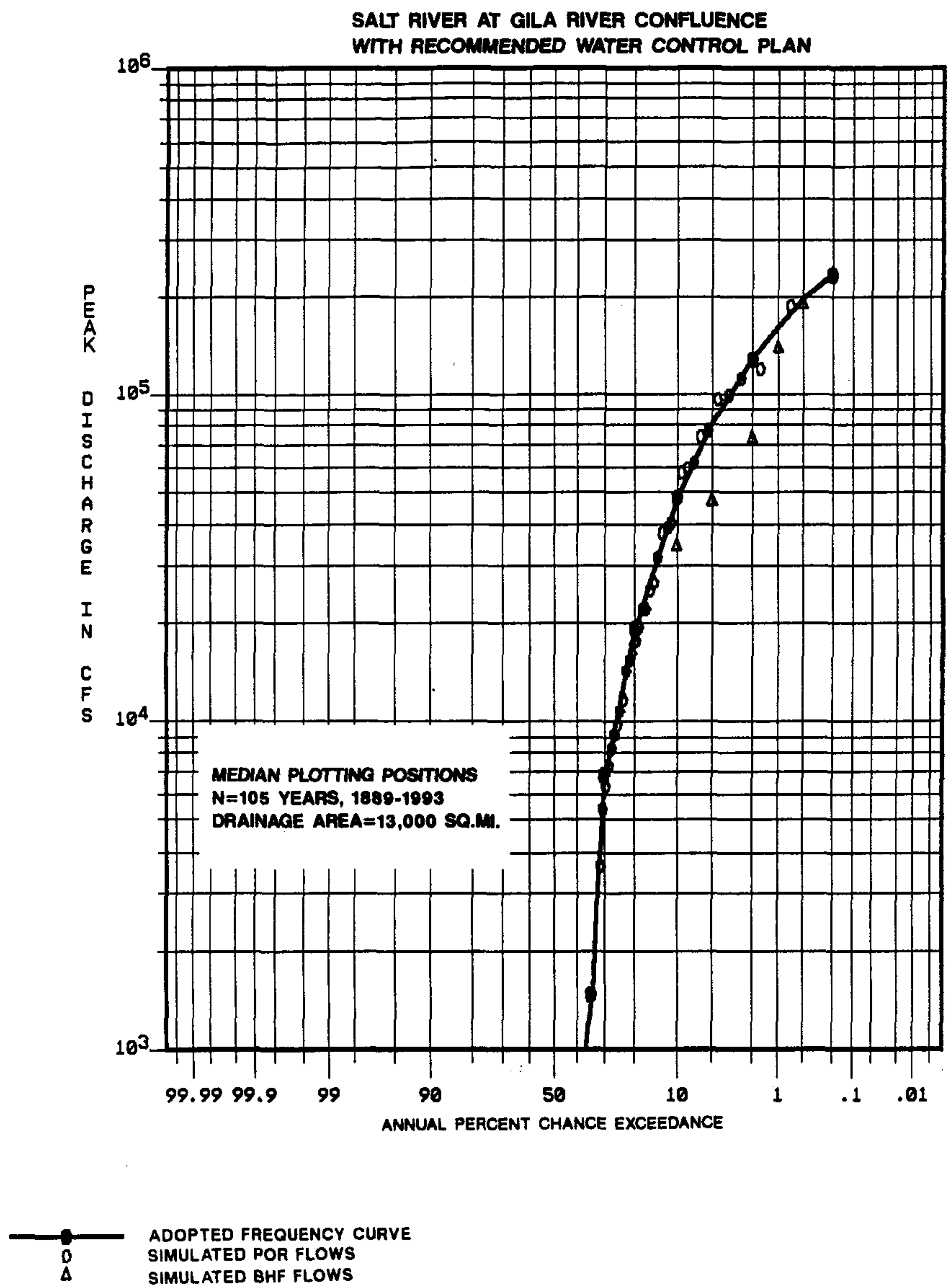

SALT RIVER AT GILA RIVER CONFLUENCE
WITH RECOMMENDED WATER CONTROL PLAN
PEAK DISCHARGE IN CFS
10^6
10^5
10^4
10^3
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=13,000 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
ADOPTED FREQUENCY CURVE
SIMULATED POR FLOWS
SIMULATED BHF FLOWS

FIGURE 15-2

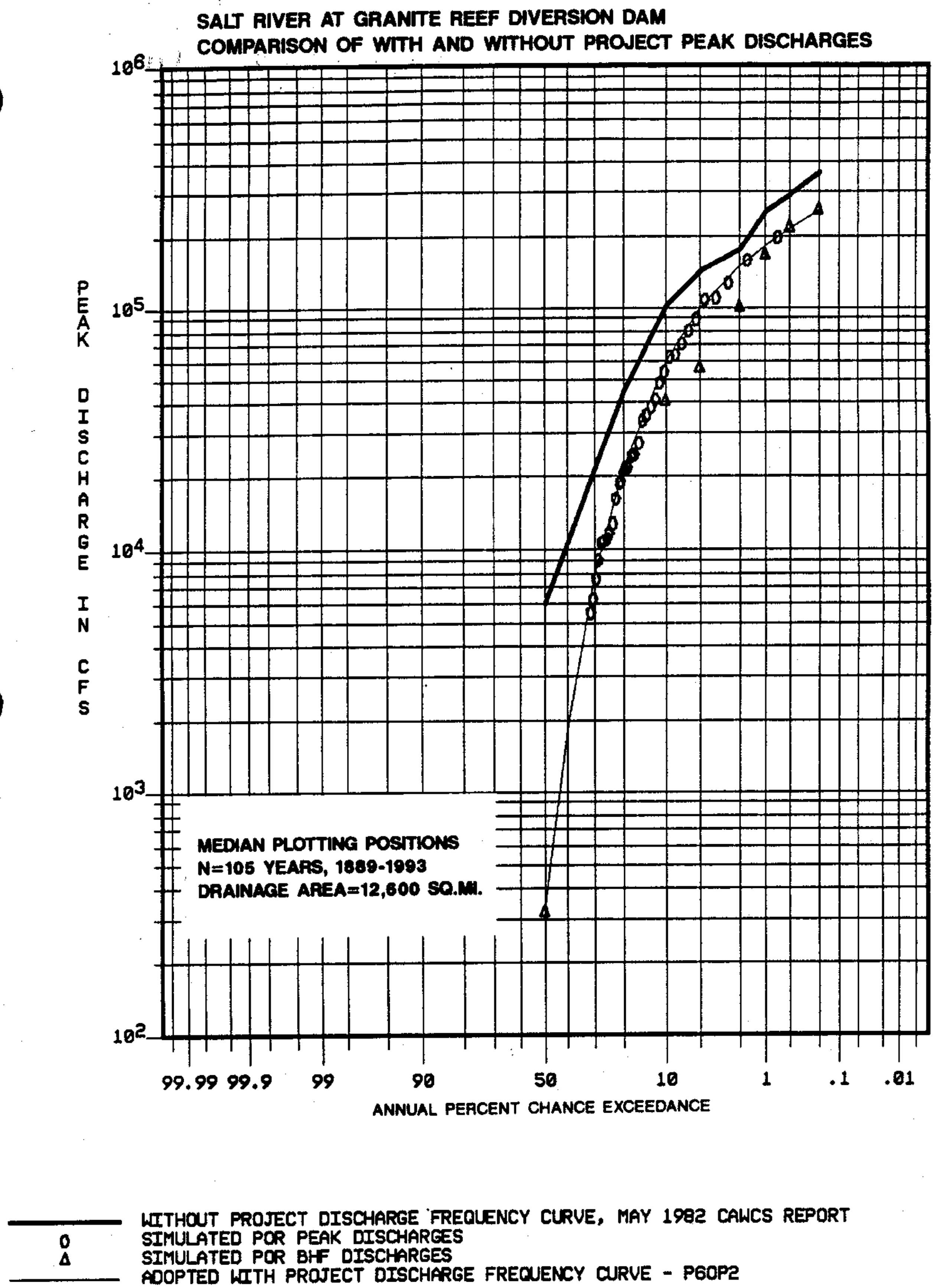

SALT RIVER AT GRANITE REEF DIVERSION DAM
COMPARISON OF WITH AND WITHOUT PROJECT PEAK DISCHARGES
PEAK DISCHARGE IN CFS
10⁶
10⁵
10⁴
10³
10²
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=12,600 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
WITHOUT PROJECT DISCHARGE FREQUENCY CURVE, MAY 1982 CAWCS REPORT
O SIMULATED POR PEAK DISCHARGES
Δ SIMULATED POR BHF DISCHARGES
ADOPTED WITH PROJECT DISCHARGE FREQUENCY CURVE - P60P2

FIGURE 15-3

16JUN95 11:05:54

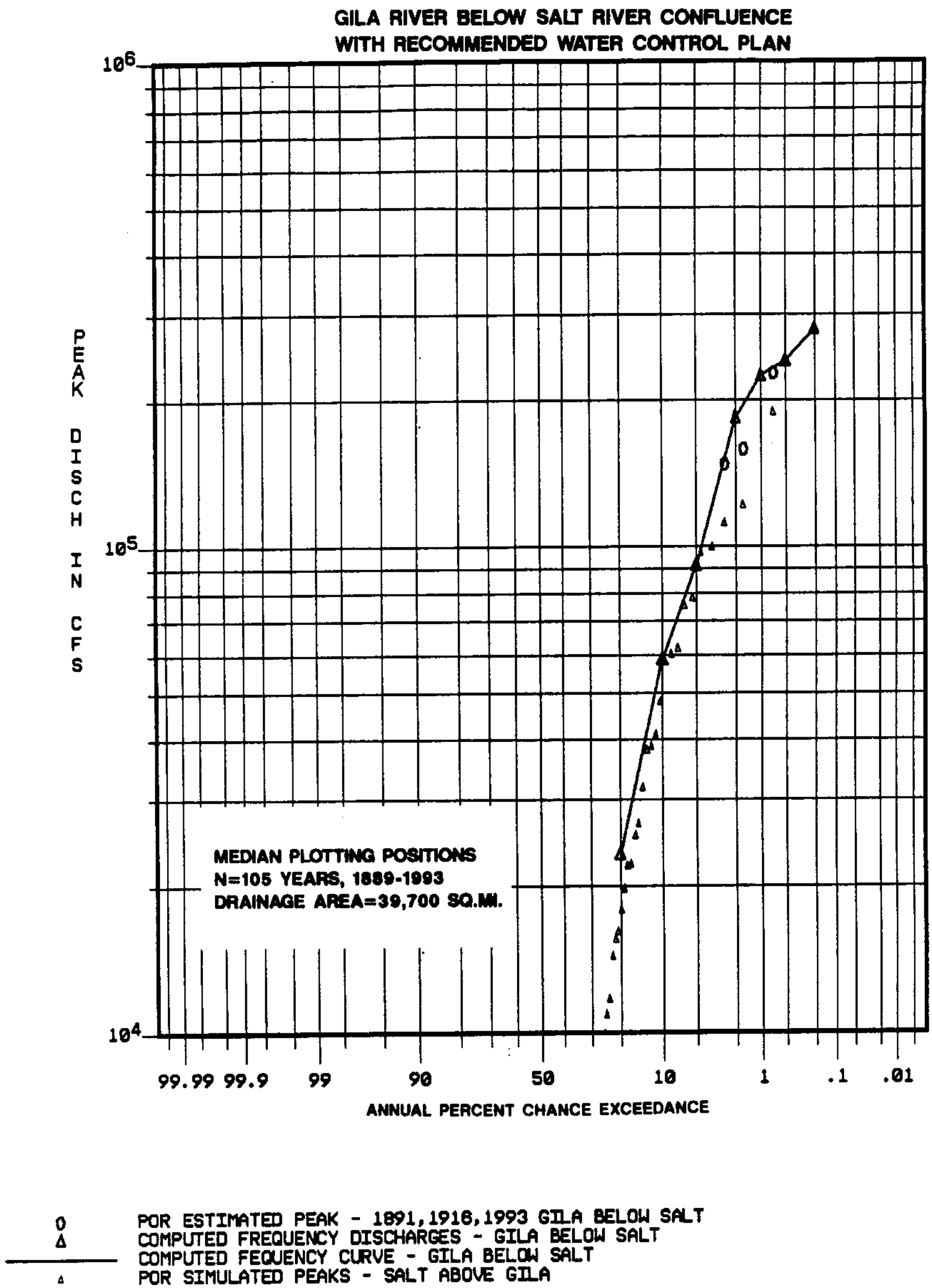
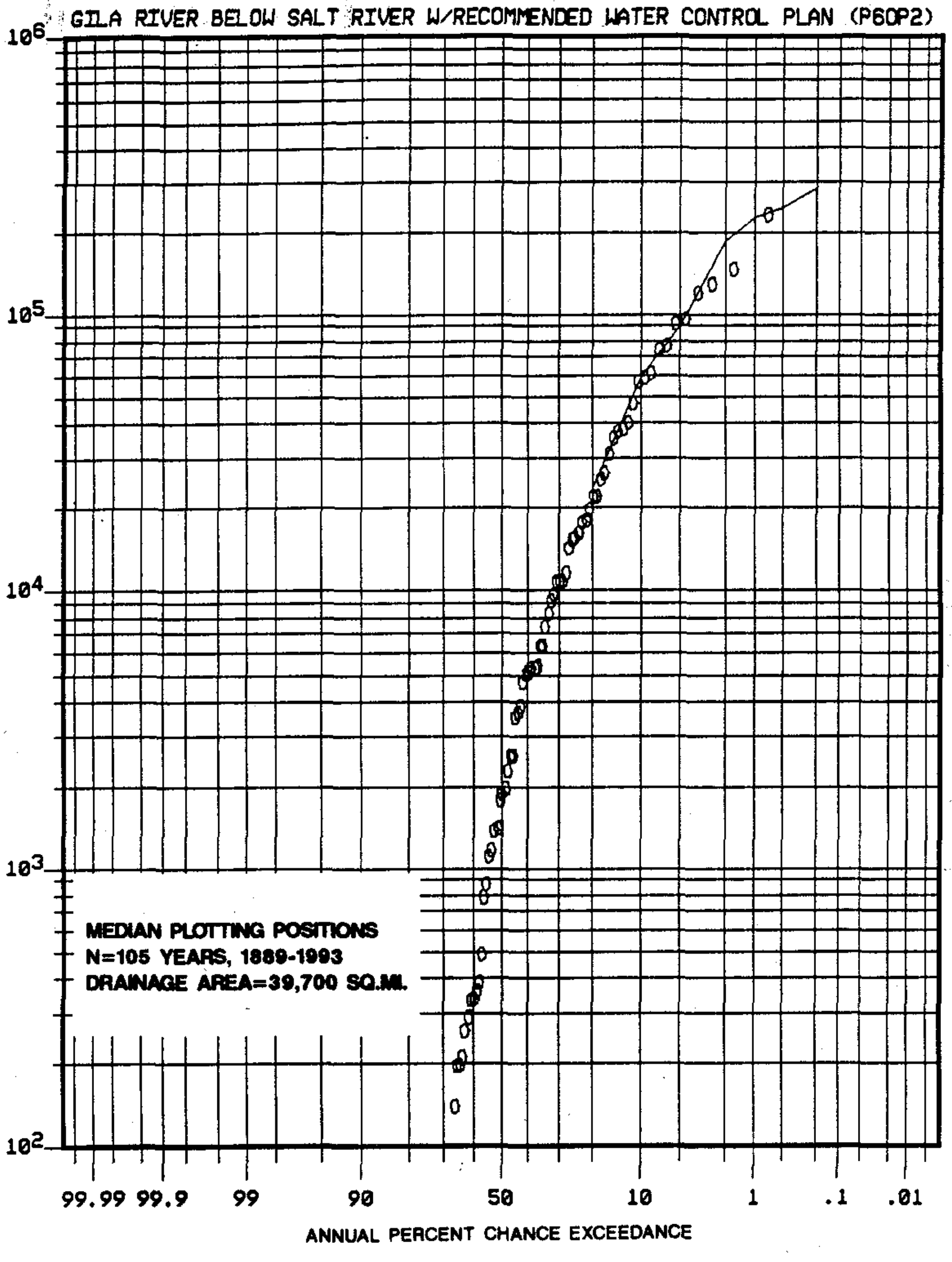


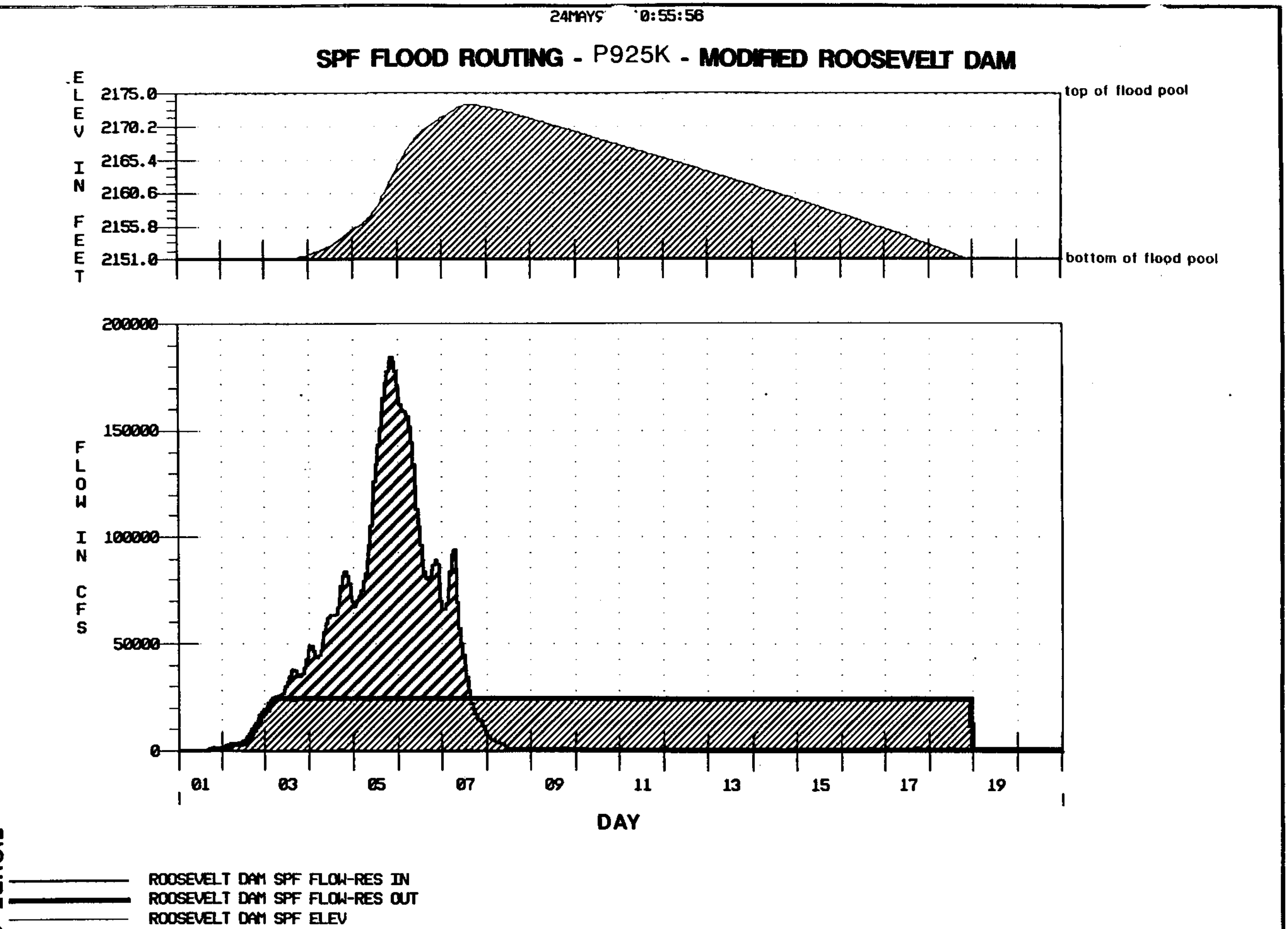
FIGURE 15-4a



0 GILA RIVER CONF POR DISCHARGES

CURVE GENERATED FROM U/S Q-PR RELATIONSHIPS

FIGURE 15-4 b



24MAY9 0:55:56
SPF FLOOD ROUTING - P925K - MODIFIED ROOSEVELT DAM
ELEV IN FEET
2175.0
2170.2
2165.4
2160.6
2155.8
2151.0
top of flood pool
bottom of flood pool
FLOW IN CFS
200000
150000
100000
50000
0
01
03
05
07
09
11
13
15
17
19
DAY
ROOSEVELT DAM SPF FLOW-RES IN
ROOSEVELT DAM SPF FLOW-RES OUT
ROOSEVELT DAM SPF ELEV

FIGURE 16-1

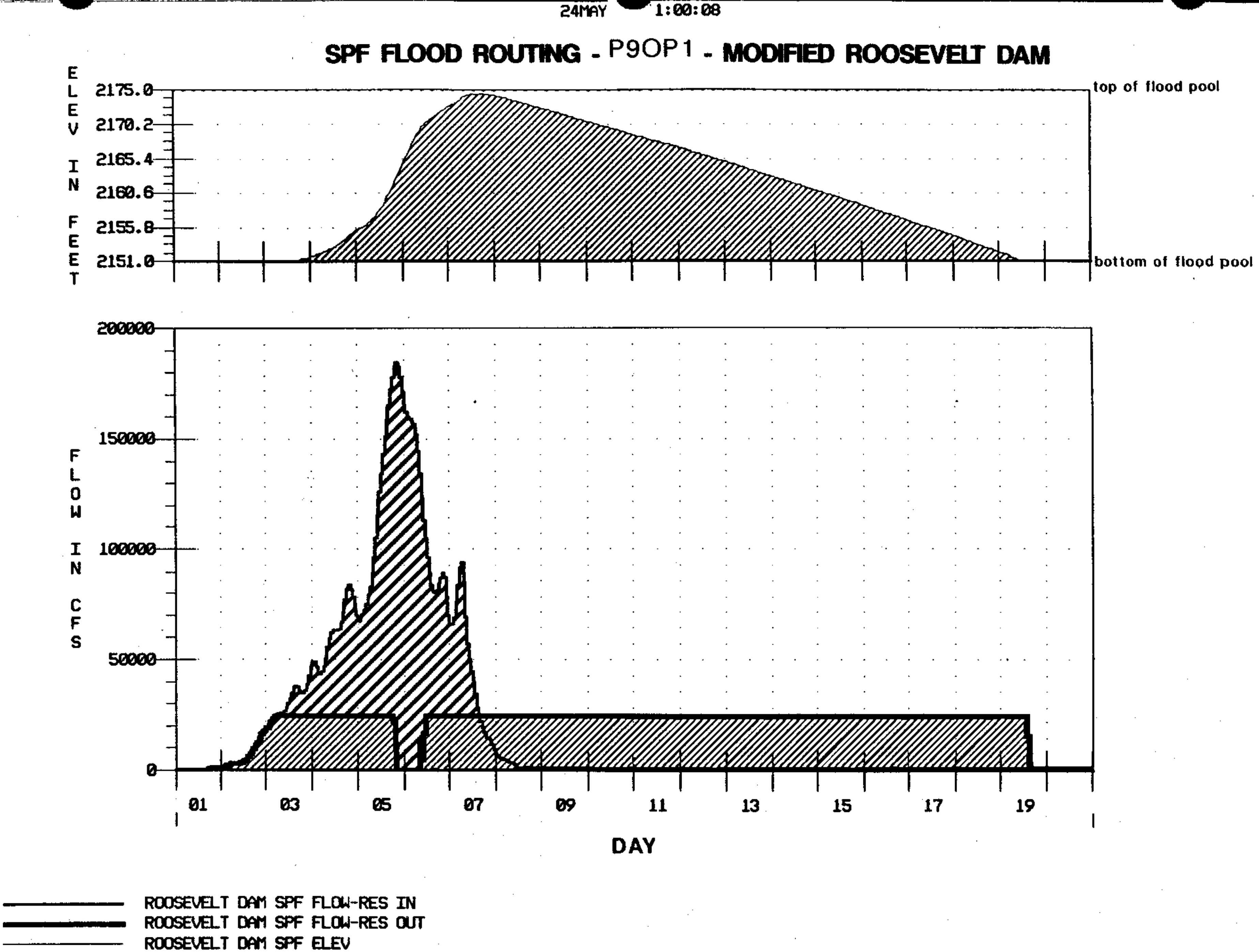

24MAY 1:00:08
SPF FLOOD ROUTING - P9OP1 - MODIFIED ROOSEVELT DAM
ELEV IN FEET
2175.0
2170.2
2165.4
2160.6
2155.8
2151.0
top of flood pool
bottom of flood pool
FLOW IN CFS
200000
150000
100000
50000
0
01
03
05
07
09
11
13
15
17
19
DAY
ROOSEVELT DAM SPF FLOW-RES IN
ROOSEVELT DAM SPF FLOW-RES OUT
ROOSEVELT DAM SPF ELEV

FIGURE 16-2

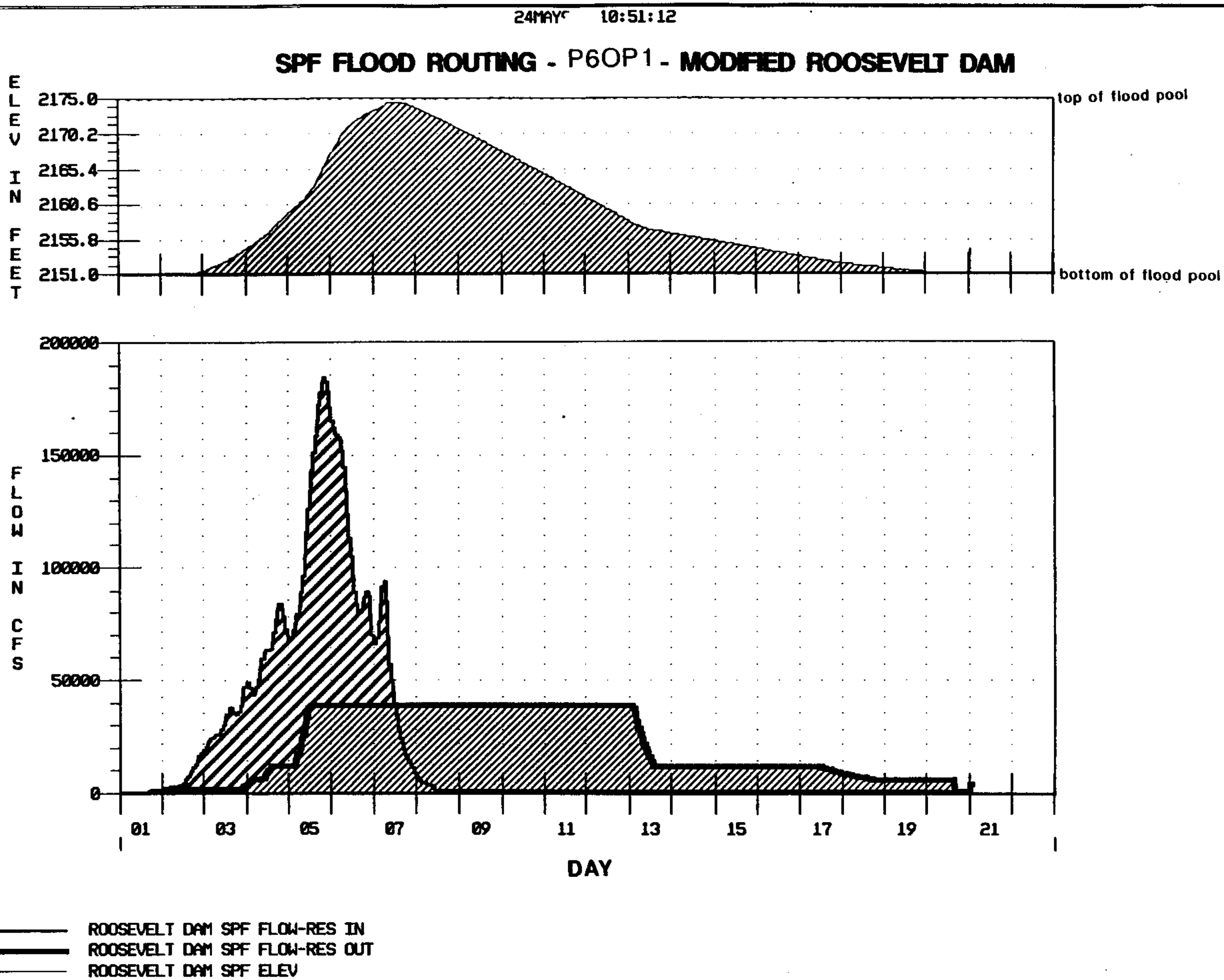
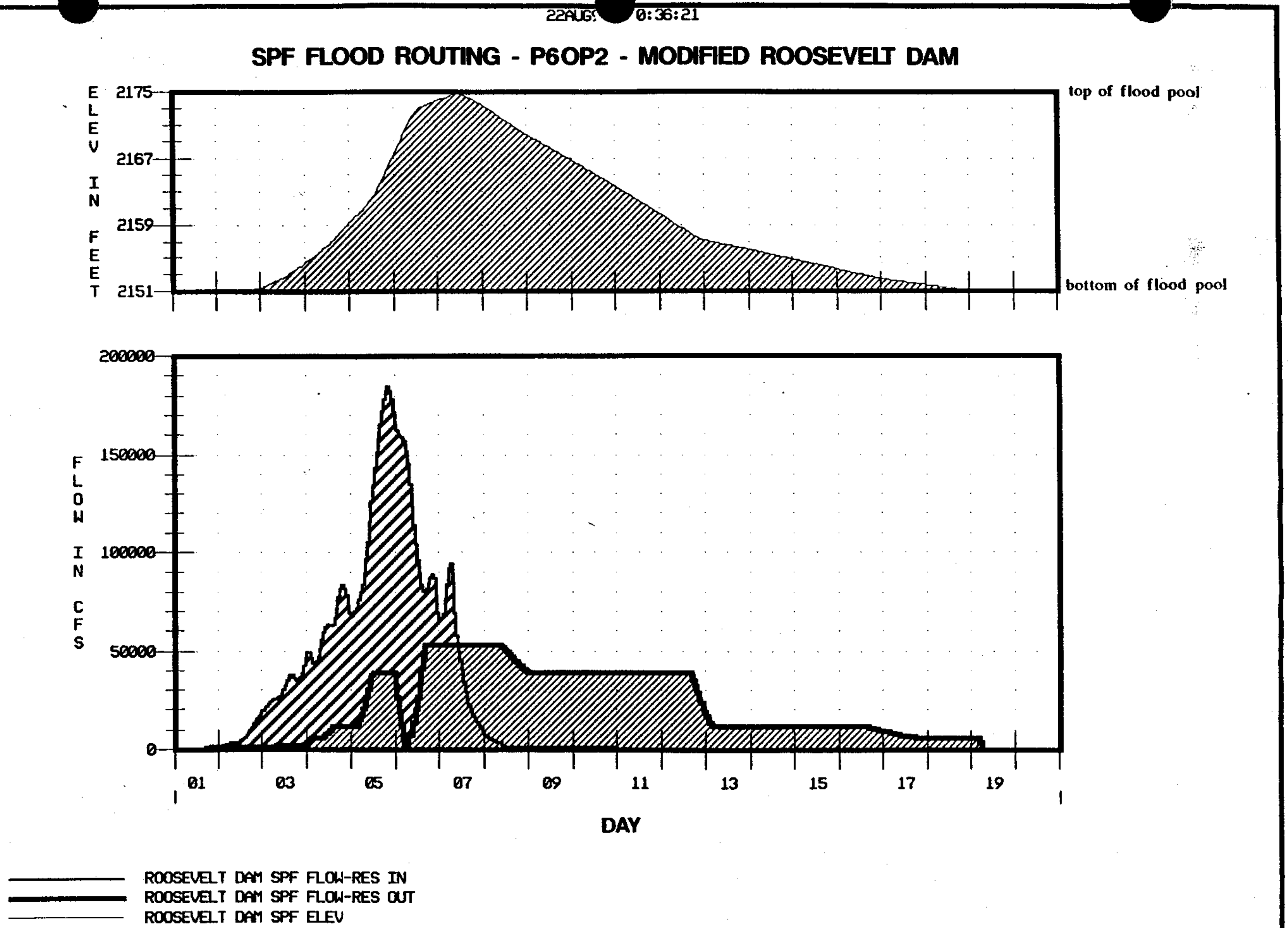

24MAY? 10:51:12
SPF FLOOD ROUTING - P6OP1 - MODIFIED ROOSEVELT DAM
ELEV IN FEET
2175.0
2170.2
2165.4
2160.6
2155.8
2151.0
top of flood pool
bottom of flood pool
FLOW IN CFS
200000
150000
100000
50000
0
01
03
05
07
09
11
13
15
17
19
21
DAY
ROOSEVELT DAM SPF FLOW-RES IN
ROOSEVELT DAM SPF FLOW-RES OUT
ROOSEVELT DAM SPF ELEV

FIGURE 16-3



22AUG9 0:36:21
SPF FLOOD ROUTING - P6OP2 - MODIFIED ROOSEVELT DAM
ELEV IN FEET
2175
2167
2159
2151
top of flood pool
bottom of flood pool
FLOW IN CFS
200000
150000
100000
50000
0
01
03
05
07
09
11
13
15
17
19
DAY
ROOSEVELT DAM SPF FLOW-RES IN
ROOSEVELT DAM SPF FLOW-RES OUT
ROOSEVELT DAM SPF ELEV

FIGURE 16-4

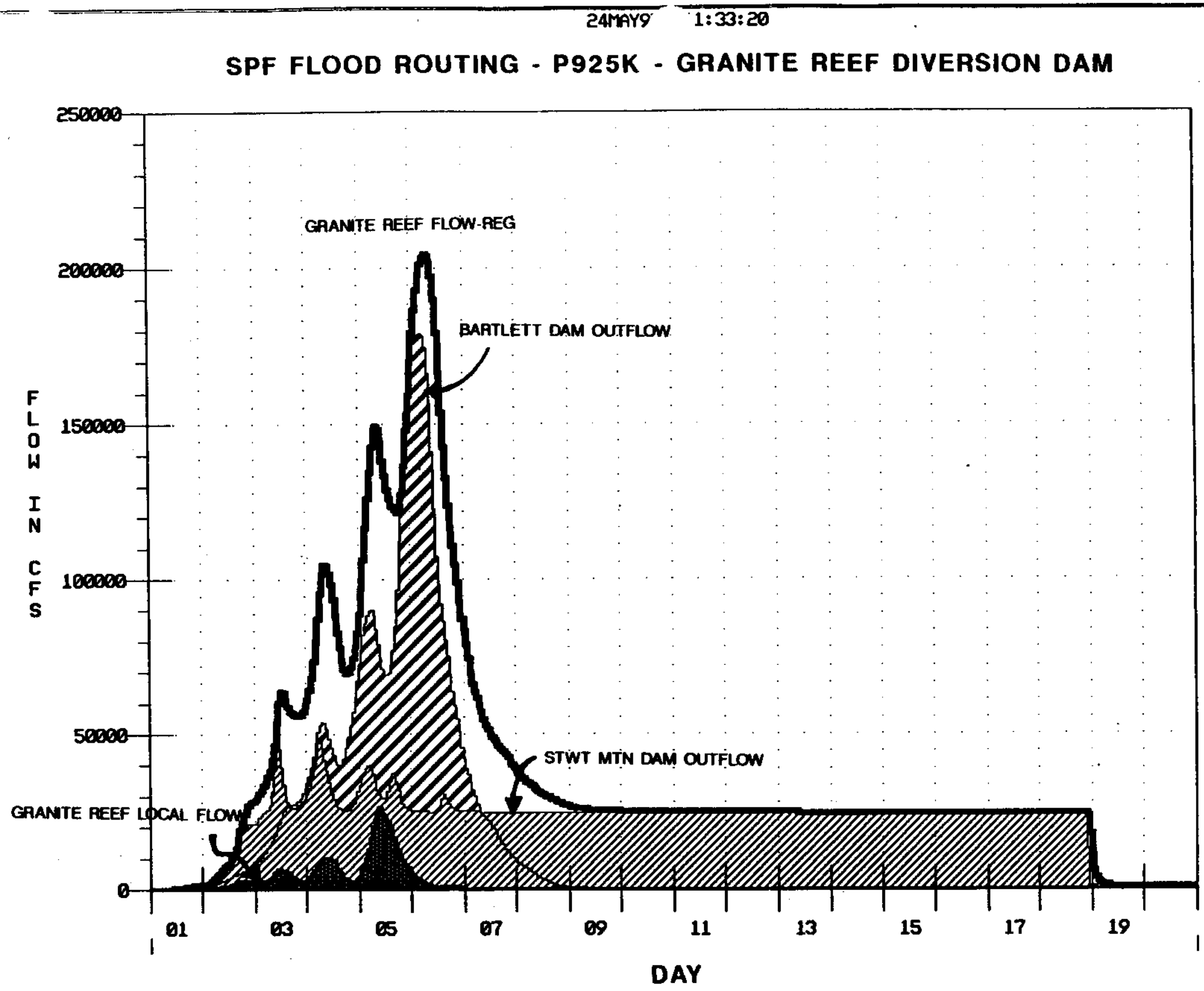

24MAY9 1:33:20
SPF FLOOD ROUTING - P925K - GRANITE REEF DIVERSION DAM
250000
200000
150000
100000
50000
0
FLOW IN CFS
GRANITE REEF FLOW-REG
BARTLETT DAM OUTFLOW
STWT MTN DAM OUTFLOW
GRANITE REEF LOCAL FLOW
01
03
05
07
09
11
13
15
17
19
DAY

FIGURE 17-1

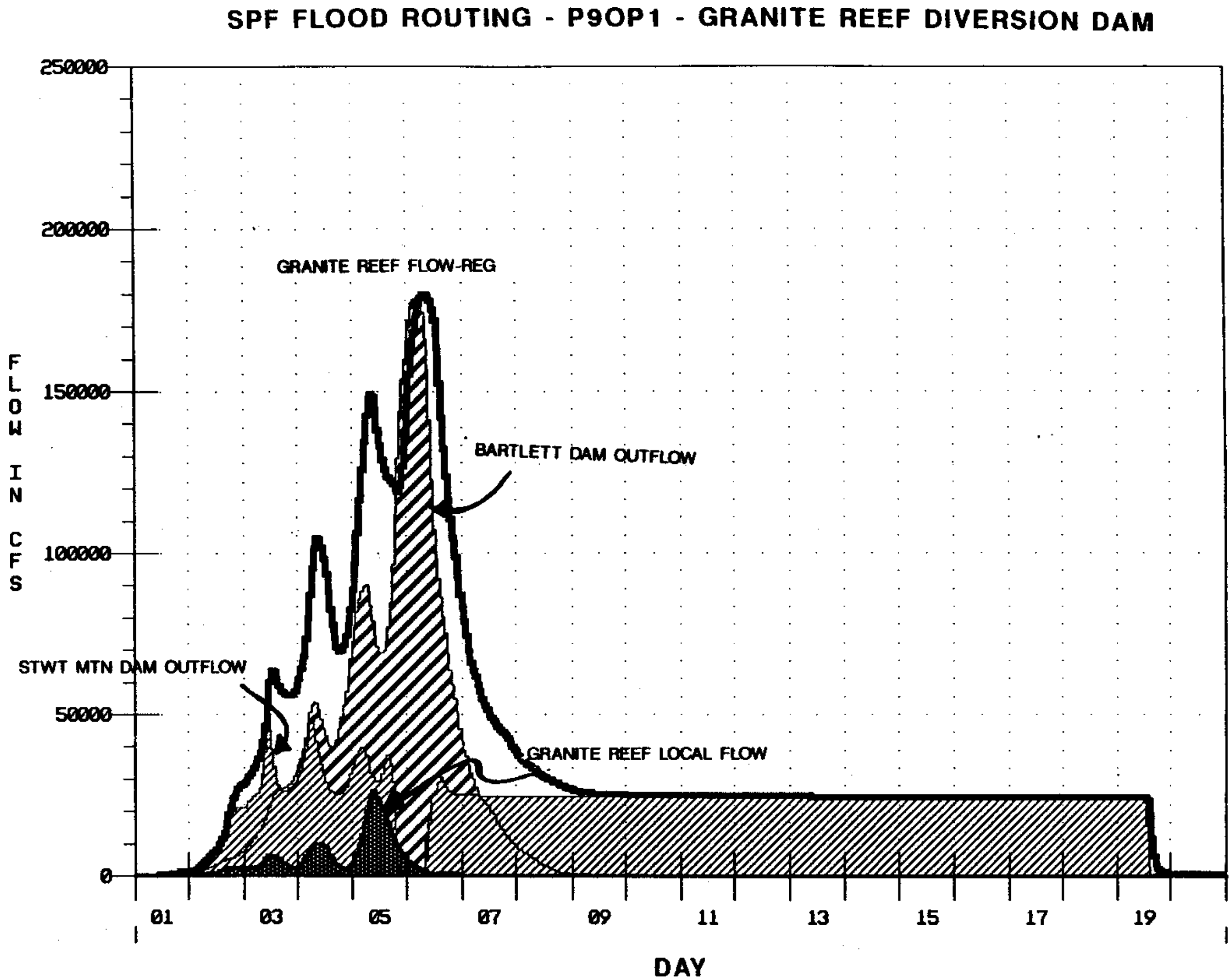

SPF FLOOD ROUTING - P9OP1 - GRANITE REEF DIVERSION DAM
250000
200000
150000
100000
50000
0
FLOW IN CFS
GRANITE REEF FLOW-REG
BARTLETT DAM OUTFLOW
STWT MTN DAM OUTFLOW
GRANITE REEF LOCAL FLOW
01
03
05
07
09
11
13
15
17
19
DAY

FIGURE 17-2

24MAY9 11:28:15

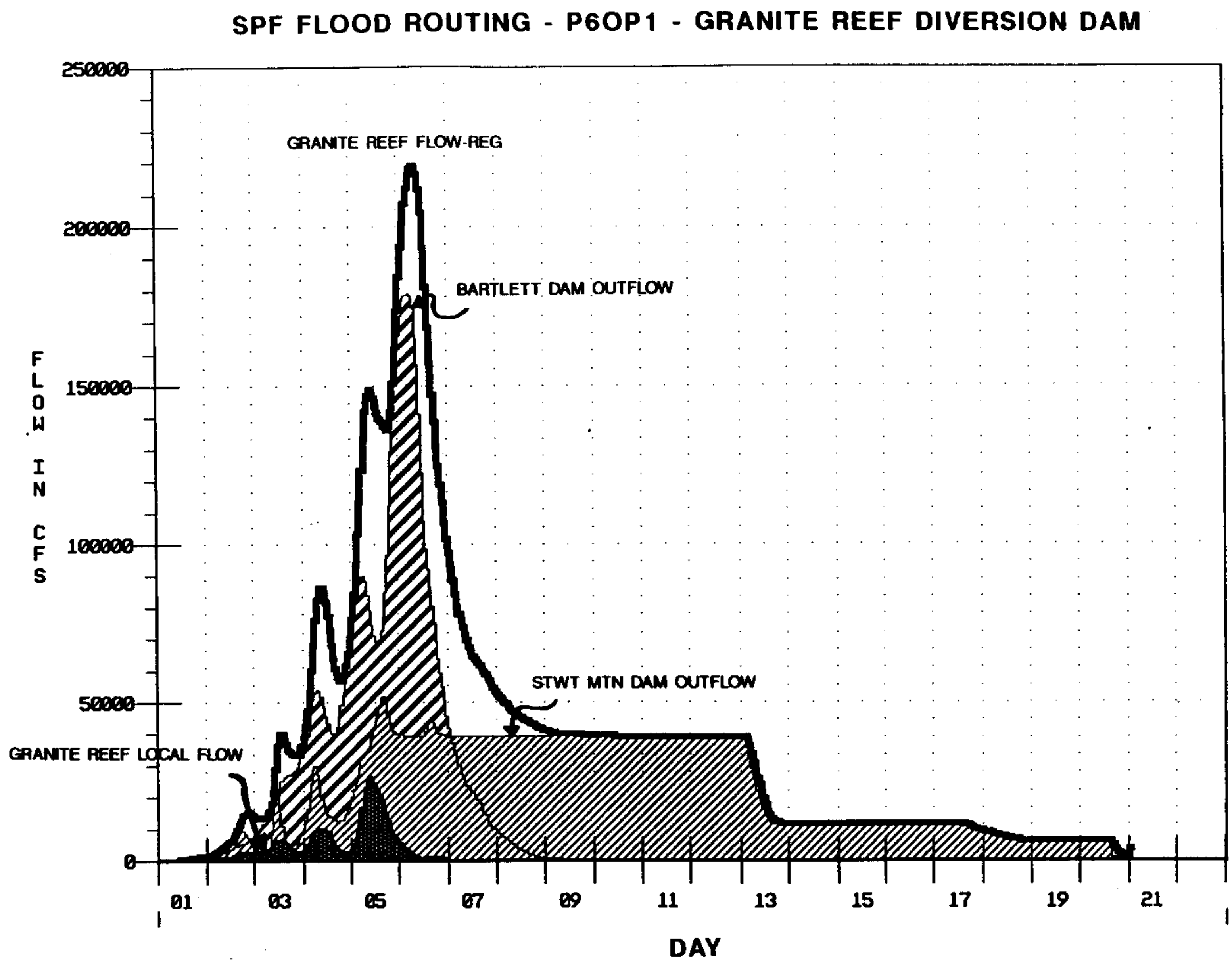


FIGURE 17-3

24MAY' [illegible]1:41:51

SPF FLOOD ROUTING - P6OP2 - GRANITE REEF DIVERSION DAM

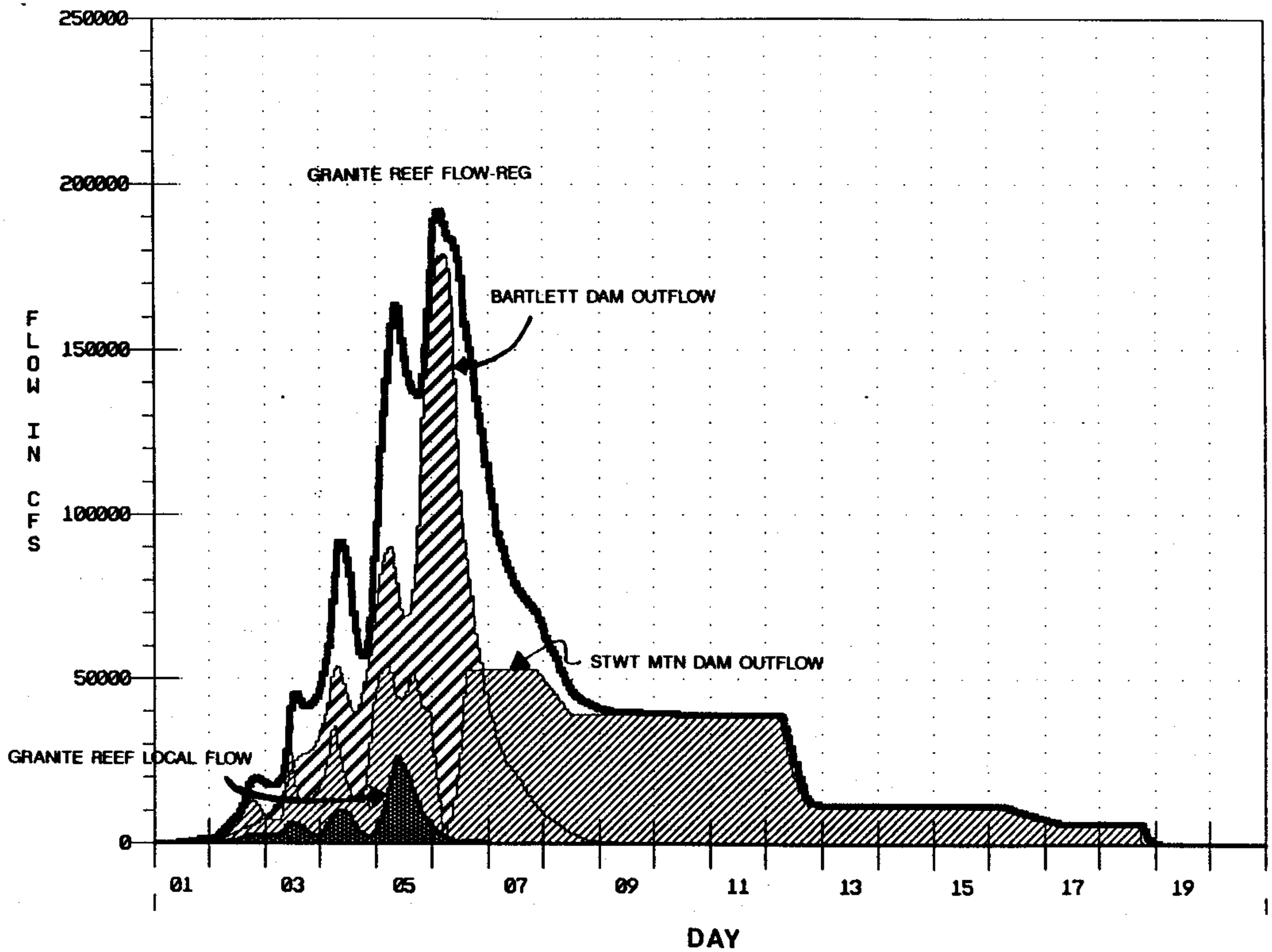
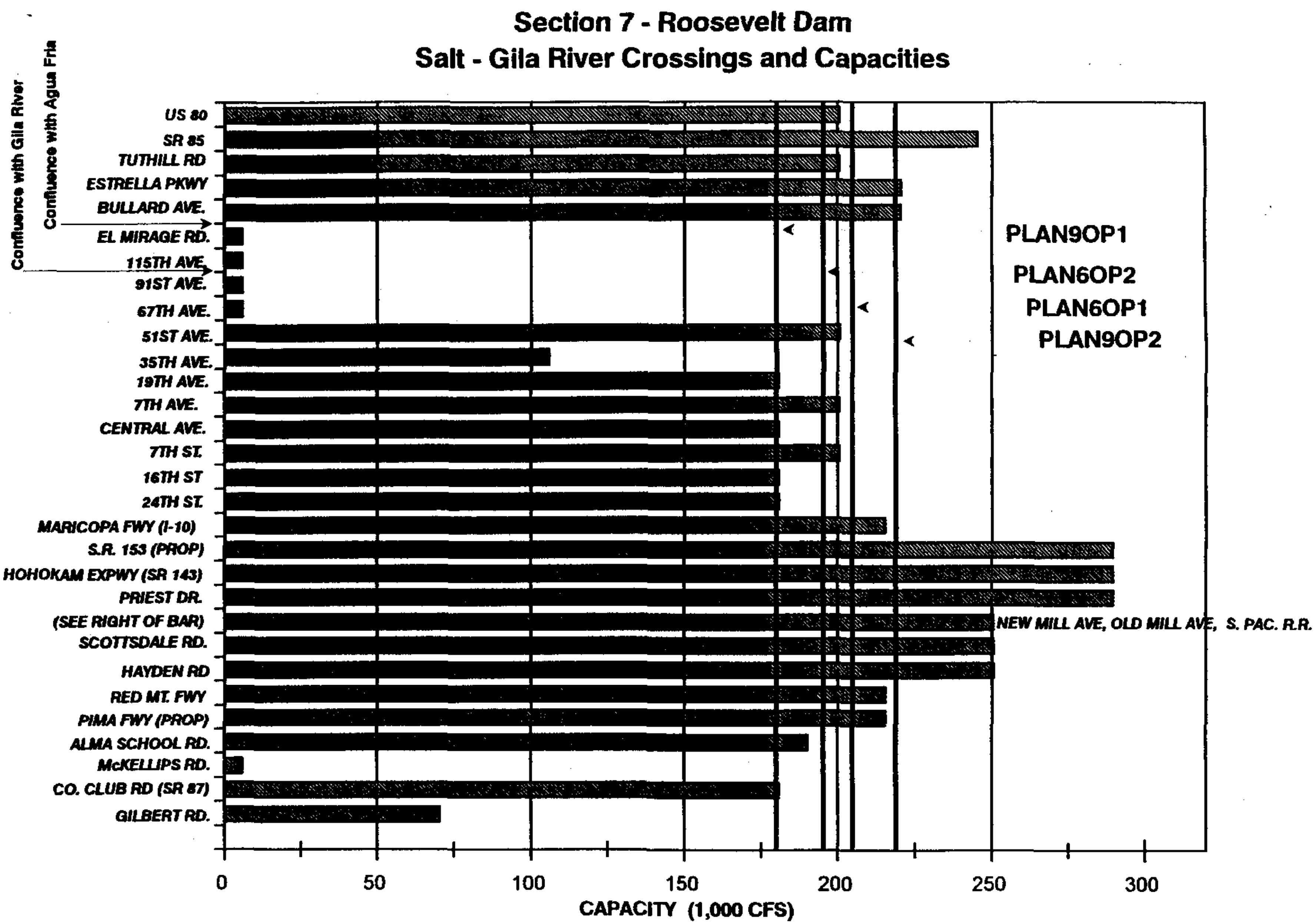


FIGURE 17-4



NOTE: *Discharge indicated for each plan is the Design Discharge (SPF) at the Salt - Verde Confluence*

FIGURE 18

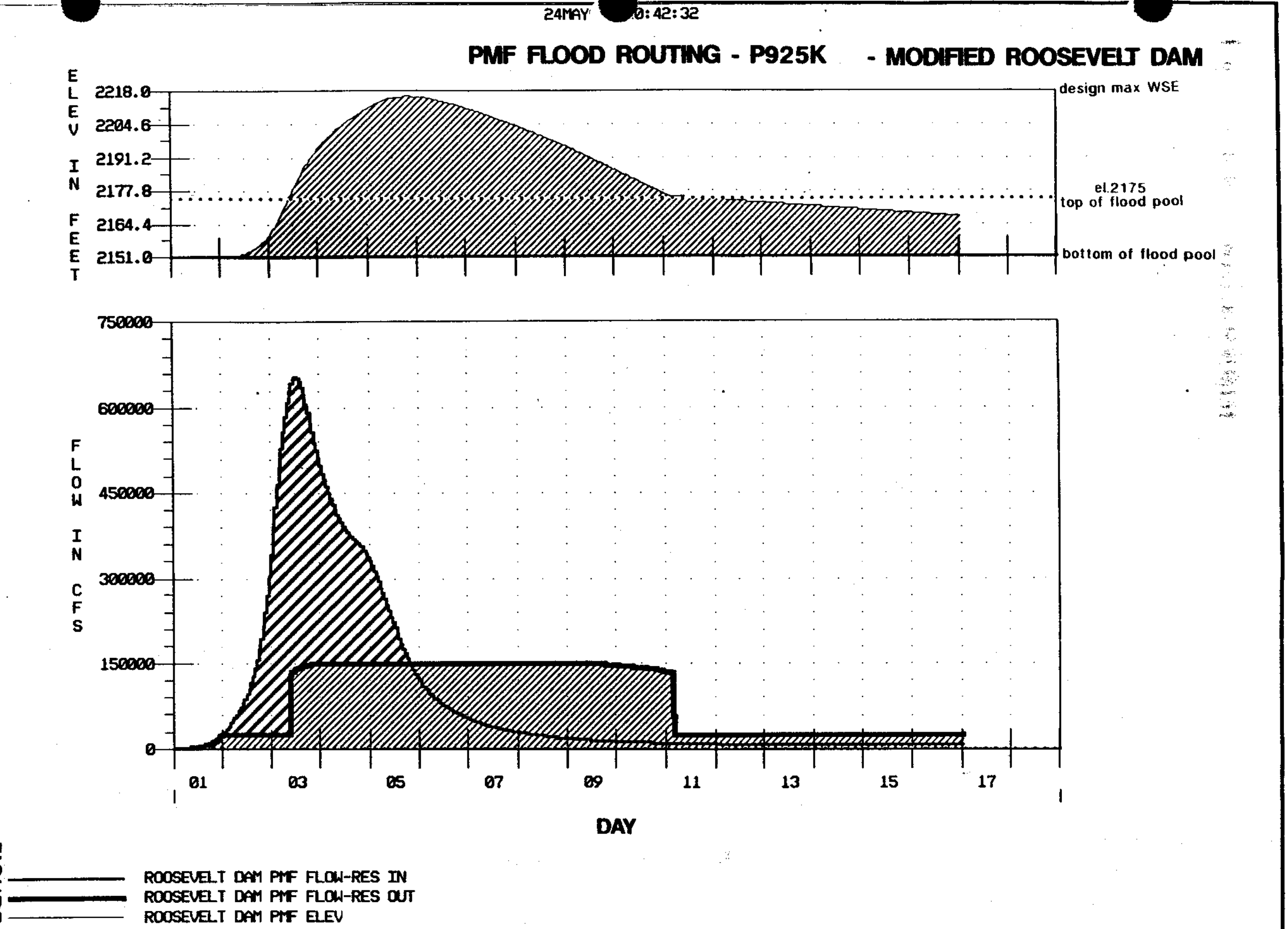

24MAY 0:42:32
PMF FLOOD ROUTING - P925K - MODIFIED ROOSEVELT DAM
ELEV IN FEET
2218.0
2204.6
2191.2
2177.8
2164.4
2151.0
design max WSE
el.2175
top of flood pool
bottom of flood pool
FLOW IN CFS
750000
600000
450000
300000
150000
0
01
03
05
07
09
11
13
15
17
DAY
ROOSEVELT DAM PMF FLOW-RES IN
ROOSEVELT DAM PMF FLOW-RES OUT
ROOSEVELT DAM PMF ELEV

FIGURE 19-1

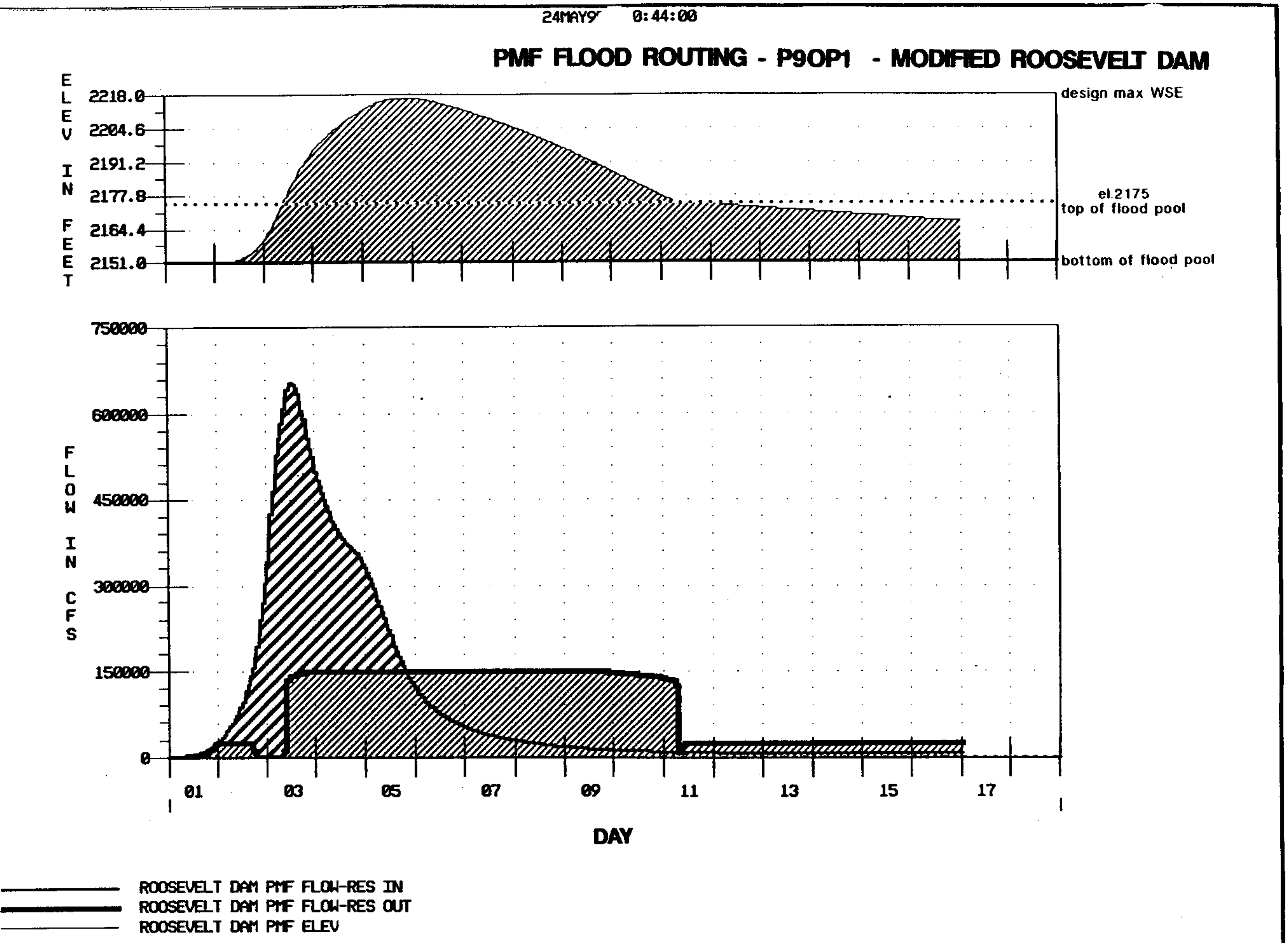

24MAY9' 0:44:00
PMF FLOOD ROUTING - P9OP1 - MODIFIED ROOSEVELT DAM
ELEV IN FEET
2218.0
2204.6
2191.2
2177.8
2164.4
2151.0
design max WSE
el.2175
top of flood pool
bottom of flood pool
FLOW IN CFS
750000
600000
450000
300000
150000
0
01
03
05
07
09
11
13
15
17
DAY
ROOSEVELT DAM PMF FLOW-RES IN
ROOSEVELT DAM PMF FLOW-RES OUT
ROOSEVELT DAM PMF ELEV

FIGURE 19-2

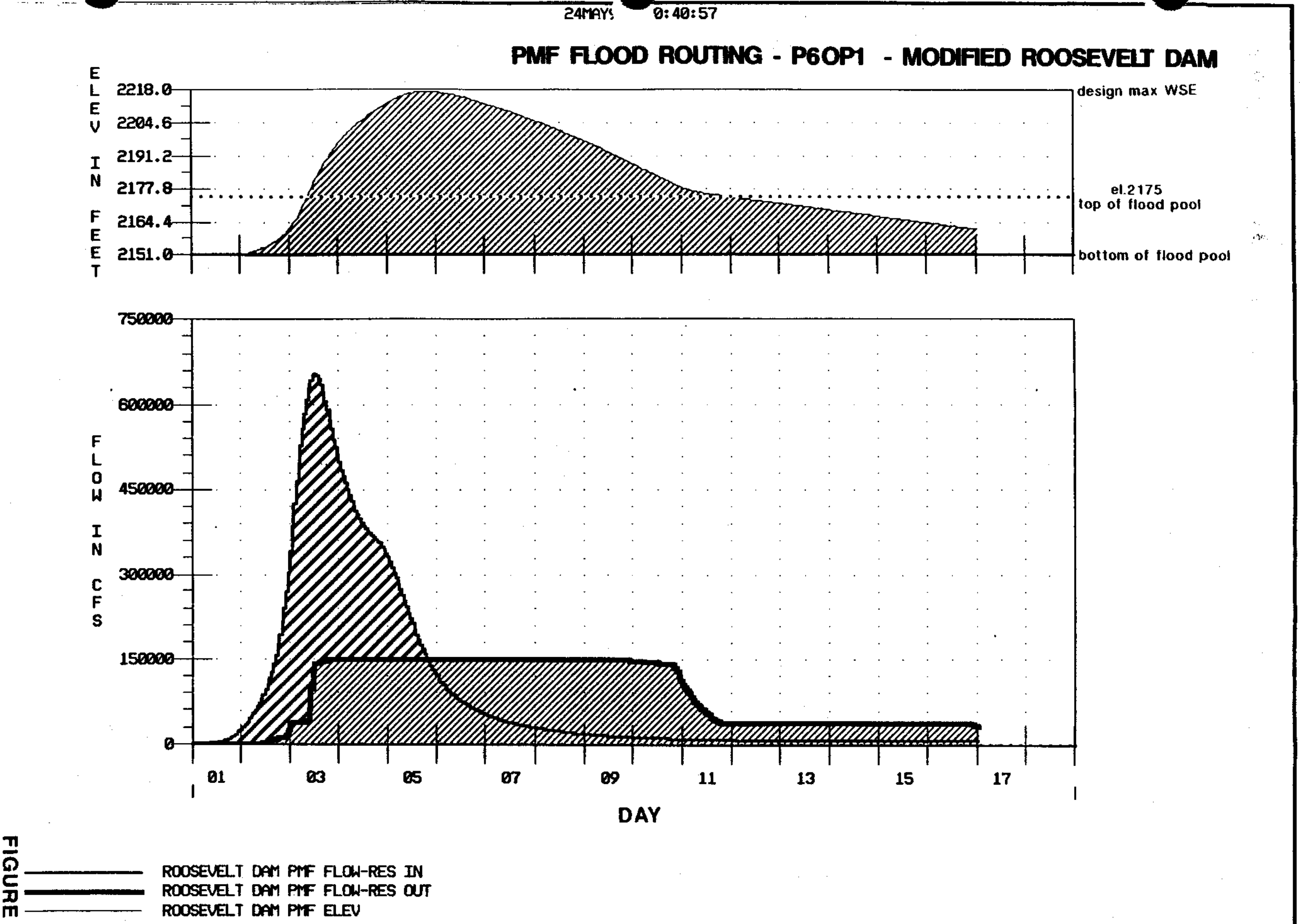
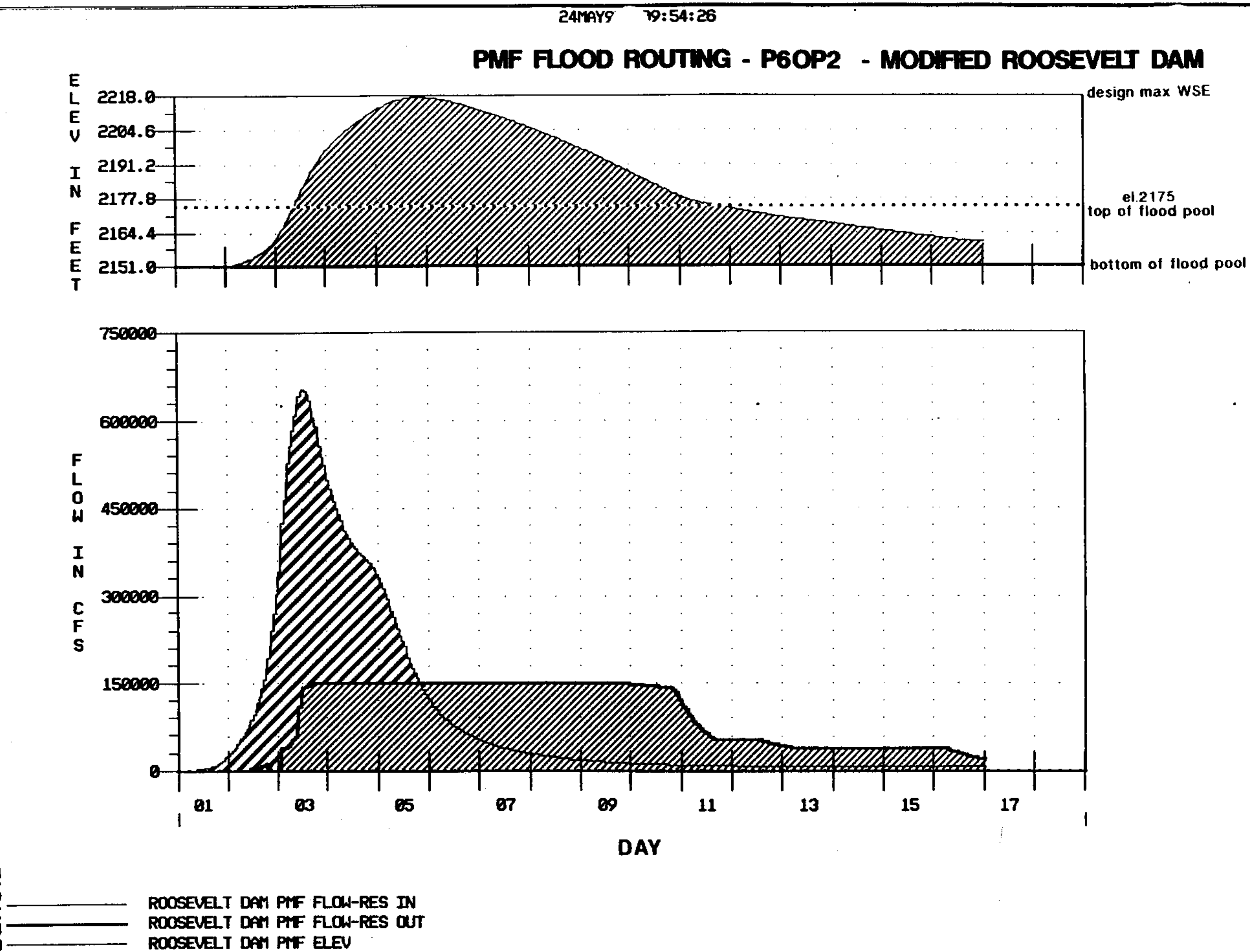

24MAY9 0:40:57
PMF FLOOD ROUTING - P6OP1 - MODIFIED ROOSEVELT DAM
ELEV IN FEET
2218.0
2204.6
2191.2
2177.8
2164.4
2151.0
design max WSE
el.2175
top of flood pool
bottom of flood pool
FLOW IN CFS
750000
600000
450000
300000
150000
0
01
03
05
07
09
11
13
15
17
DAY
ROOSEVELT DAM PMF FLOW-RES IN
ROOSEVELT DAM PMF FLOW-RES OUT
ROOSEVELT DAM PMF ELEV

FIGURE 19-3



24MAY9 39:54:26
PMF FLOOD ROUTING - P6OP2 - MODIFIED ROOSEVELT DAM
ELEV IN FEET
2218.0
2204.6
2191.2
2177.8
2164.4
2151.0
design max WSE
el.2175
top of flood pool
bottom of flood pool
FLOW IN CFS
750000
600000
450000
300000
150000
0
01
03
05
07
09
11
13
15
17
DAY
ROOSEVELT DAM PMF FLOW-RES IN
ROOSEVELT DAM PMF FLOW-RES OUT
ROOSEVELT DAM PMF ELEV

FIGURE 19-4

24MAY9 0:09:58

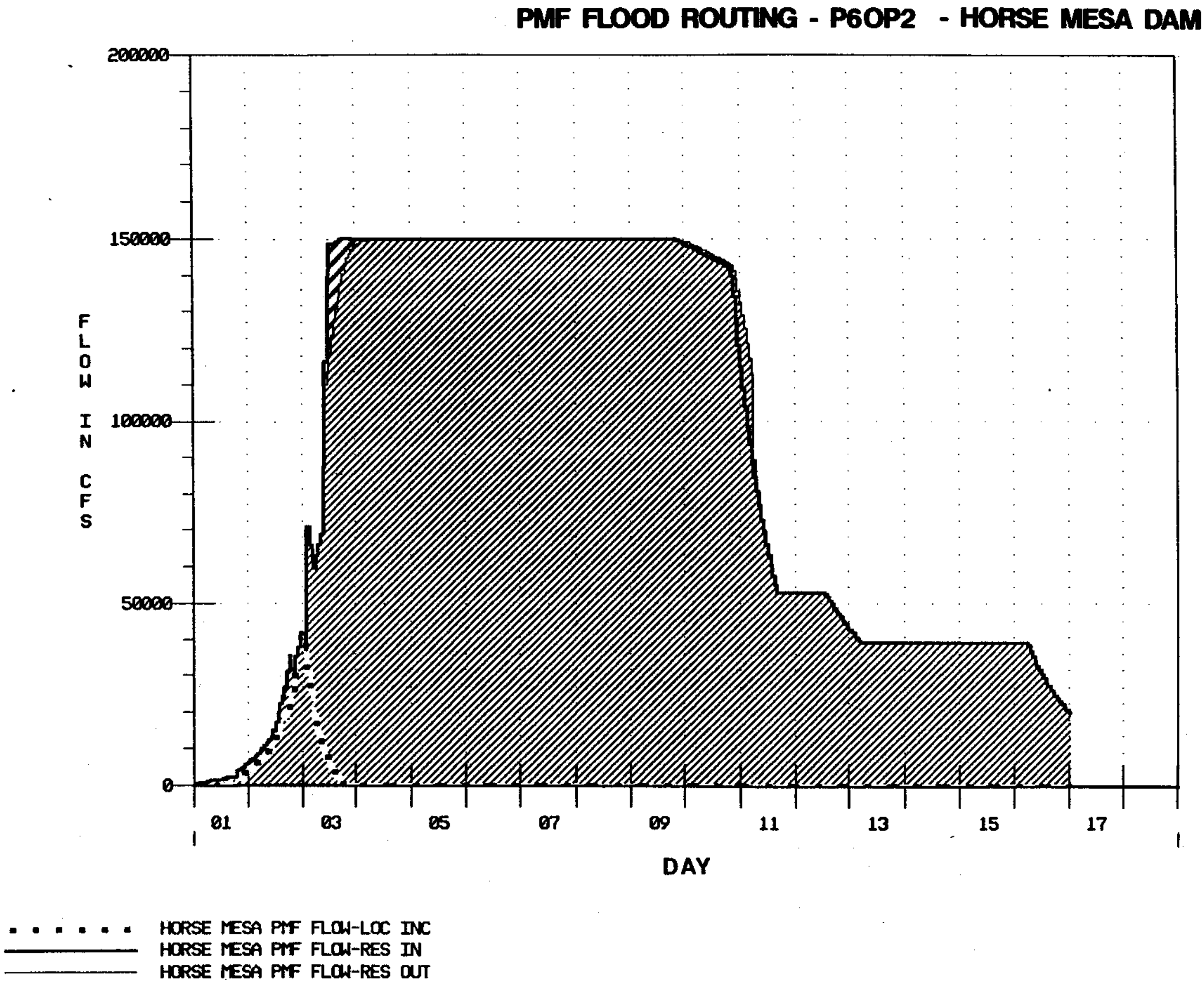


FIGURE 20-1

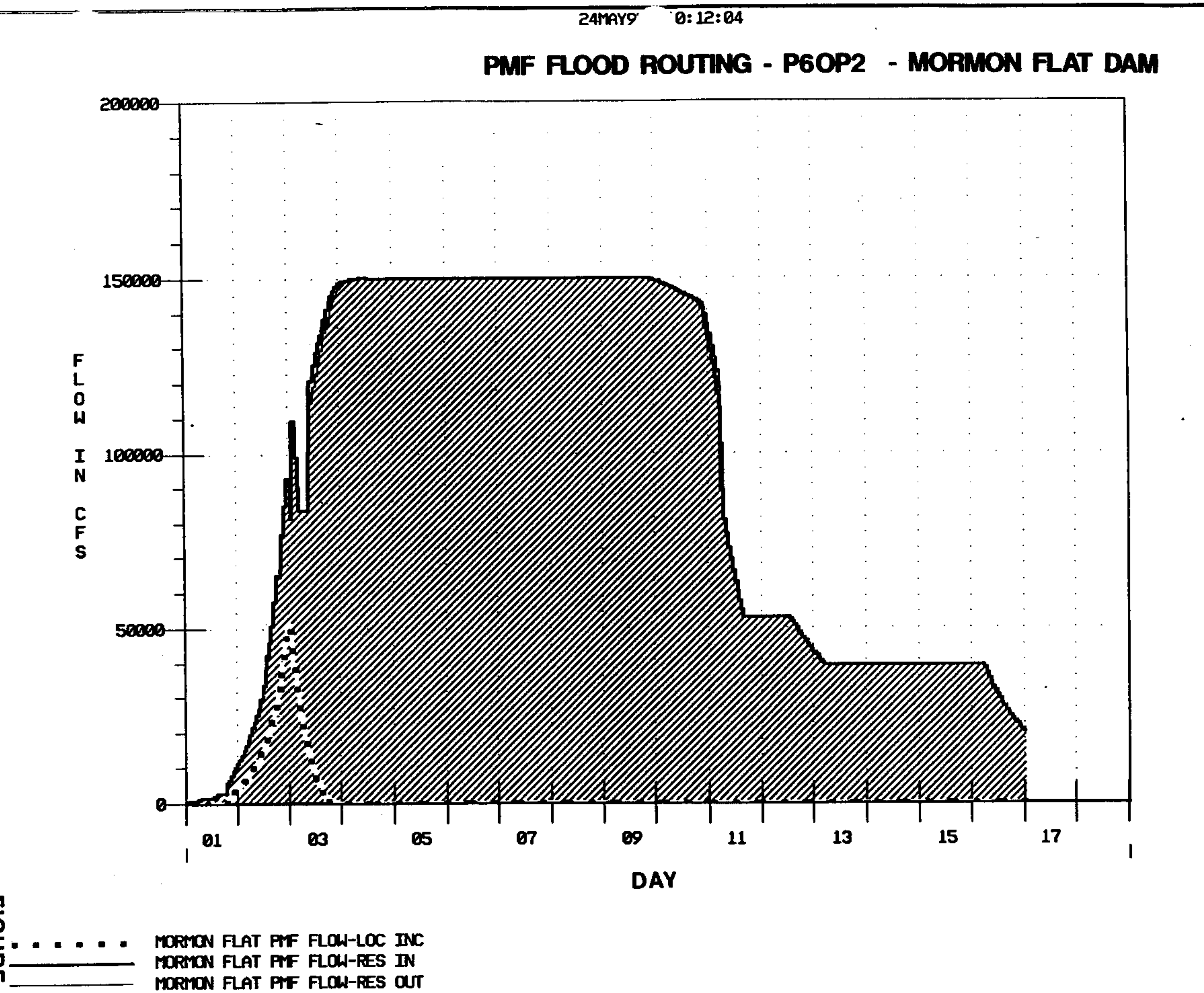

24MAY9 0:12:04
PMF FLOOD ROUTING - P6OP2 - MORMON FLAT DAM
200000
150000
100000
50000
0
FLOW IN CFS
01
03
05
07
09
11
13
15
17
DAY
MORMON FLAT PMF FLOW-LOC INC
MORMON FLAT PMF FLOW-RES IN
MORMON FLAT PMF FLOW-RES OUT

FIGURE 20-2

24MAY95 0:13:56

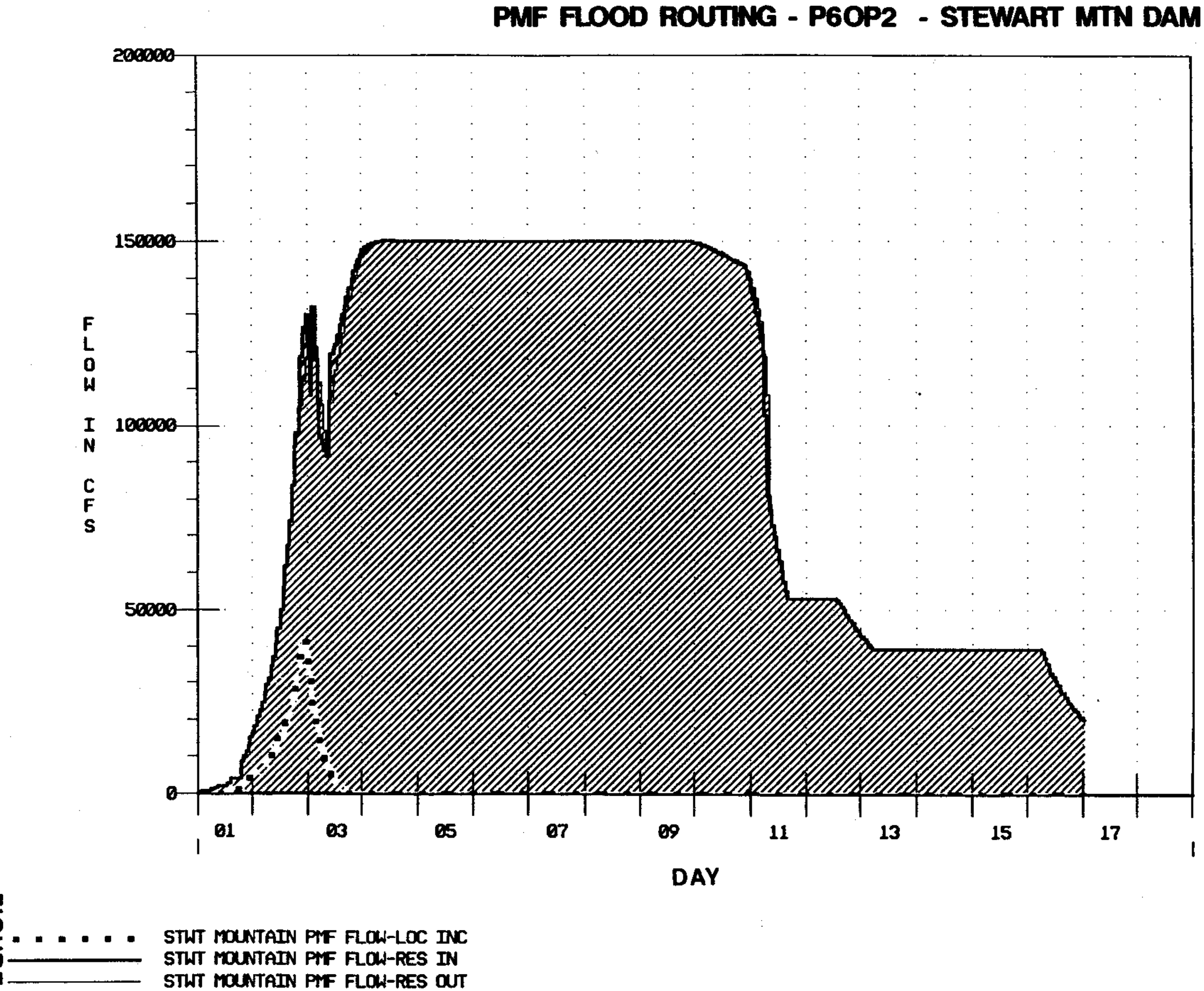
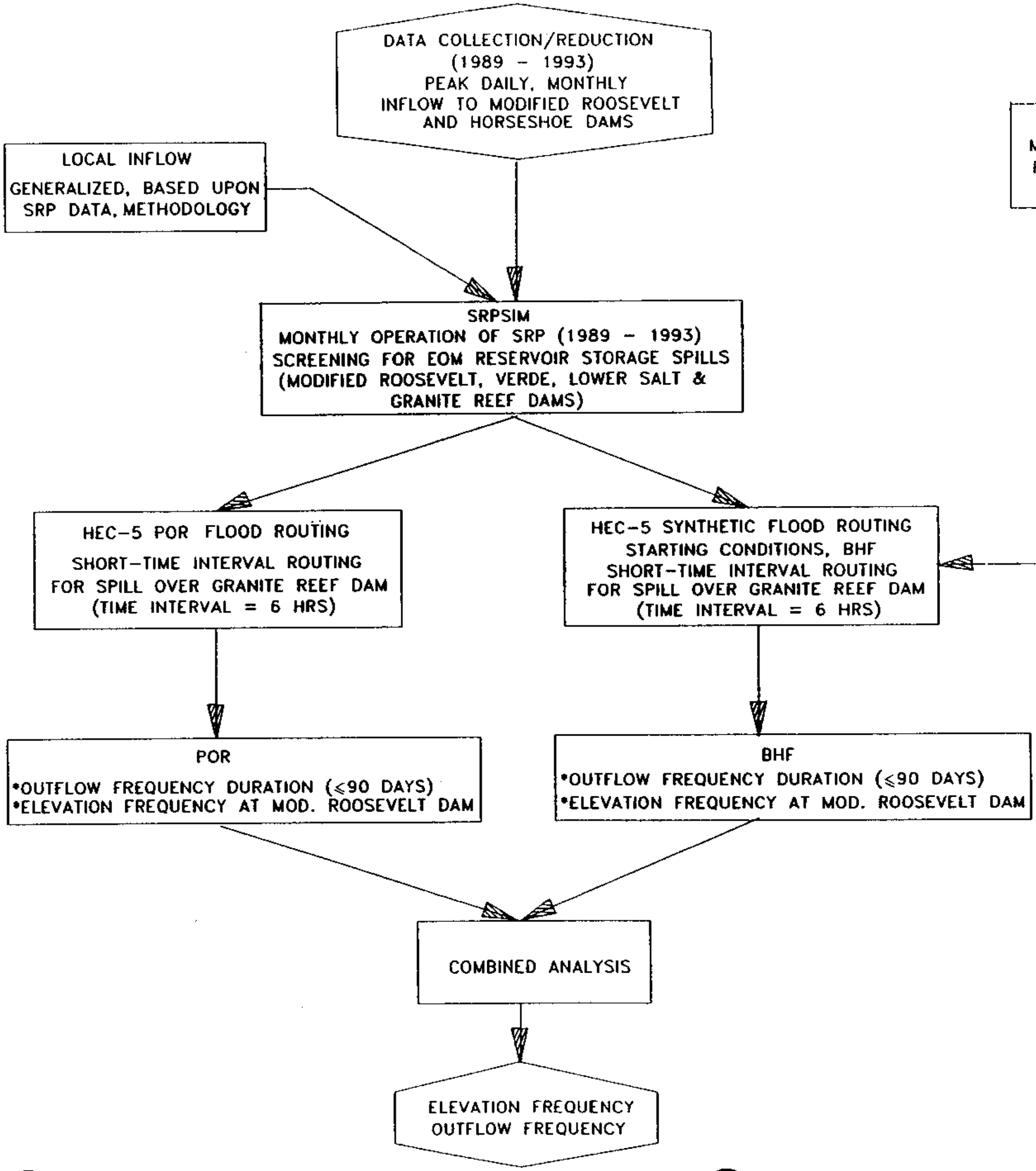


FIGURE 20-3



MODIFIED ROOSEVELT DAM
SALT RIVER, ARIZONA
SECTION 7 STUDY

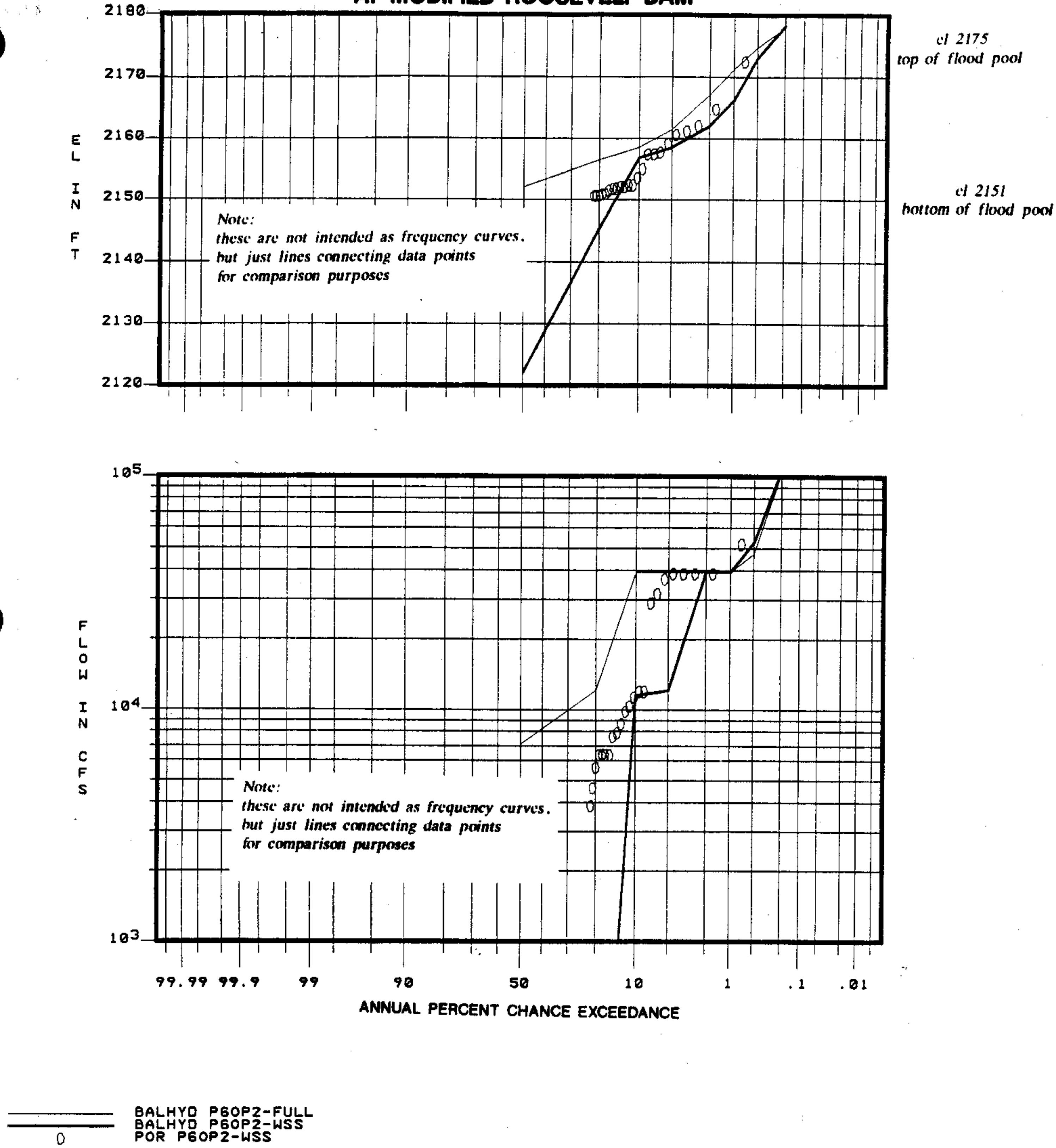
SCHEMATIC ANALYTICAL APPROACH TO ELEV-OUTFLOW FREQUENCY DETERMINATION

U.S. AMRY CORPS OF ENGINNERS
LOS ANGELES DISTRICT

FIGURE 21

06JUN95 09:05:15

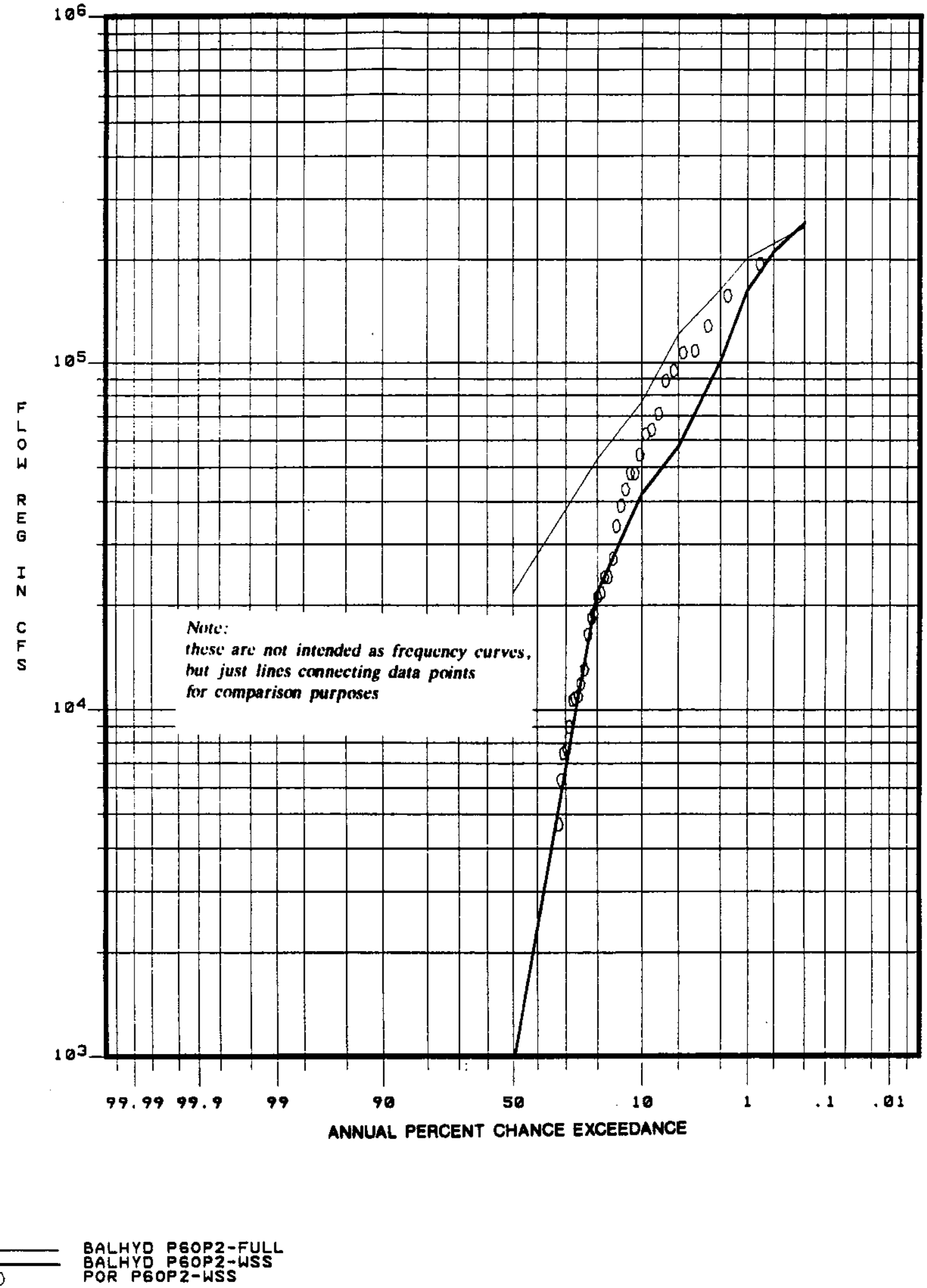
COMPARISON OF FREQUENCY INFORMATION
90-DAY CALIBRATION RESULTS FOR STARTING STORAGE
AT MODIFIED ROOSEVELT DAM



wss=with adjusted starting storage

FIGURE 22-1

COMPARISON OF FREQUENCY INFORMATION
90-DAY CALIBRATION RESULTS FOR STARTING STORAGE
AT GRANITE REEF DIVERSION DAM



wss=with adjusted starting storage

FIGURE 22-2

30MAY95 08:48:53

CALIBRATION OF 90-DAY BHF'S TO 3-MONTH SRPSIM SPILLS AT STEWART MTN DAM

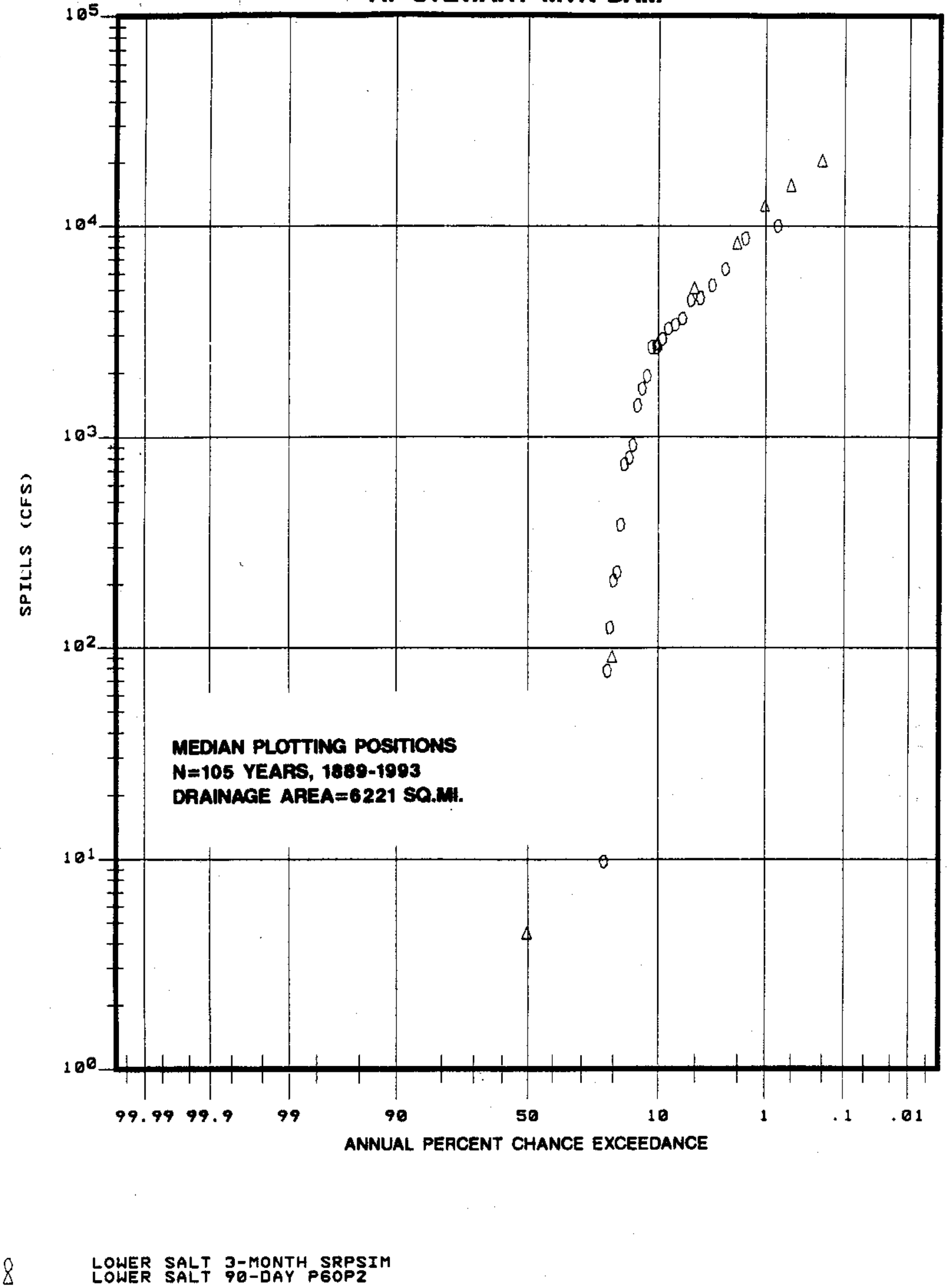


FIGURE 23-1

CALIBRATION OF 90-DAY BHF'S TO 3-MONTH SRPSIM SPILLS AT BARTLETT DAM

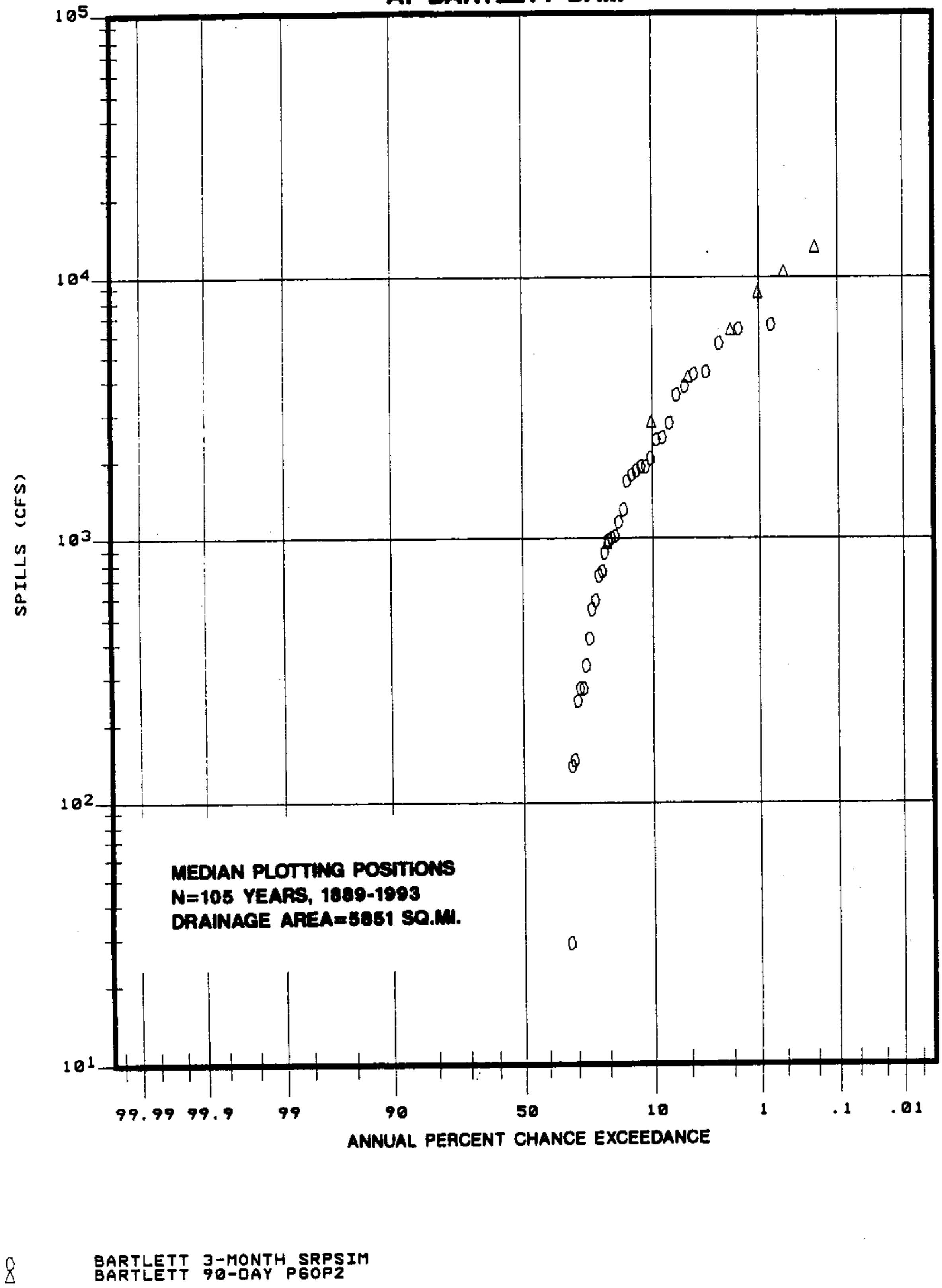


FIGURE 23-2

CALIBRATION OF 90-DAY BHF'S TO 3-MONTH SRPSIM SPILLS AT GRANITE REEF DIVERSION DAM

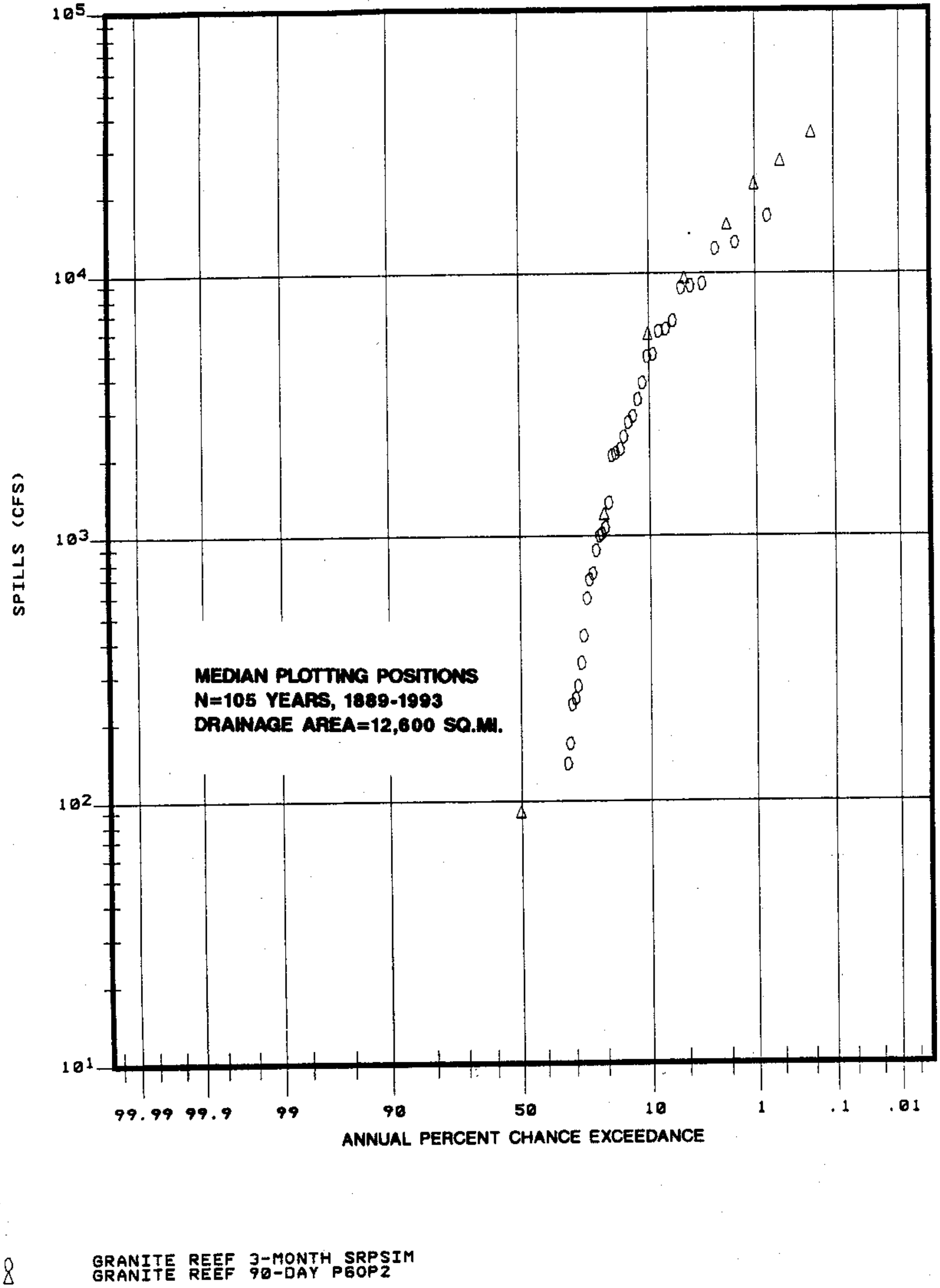
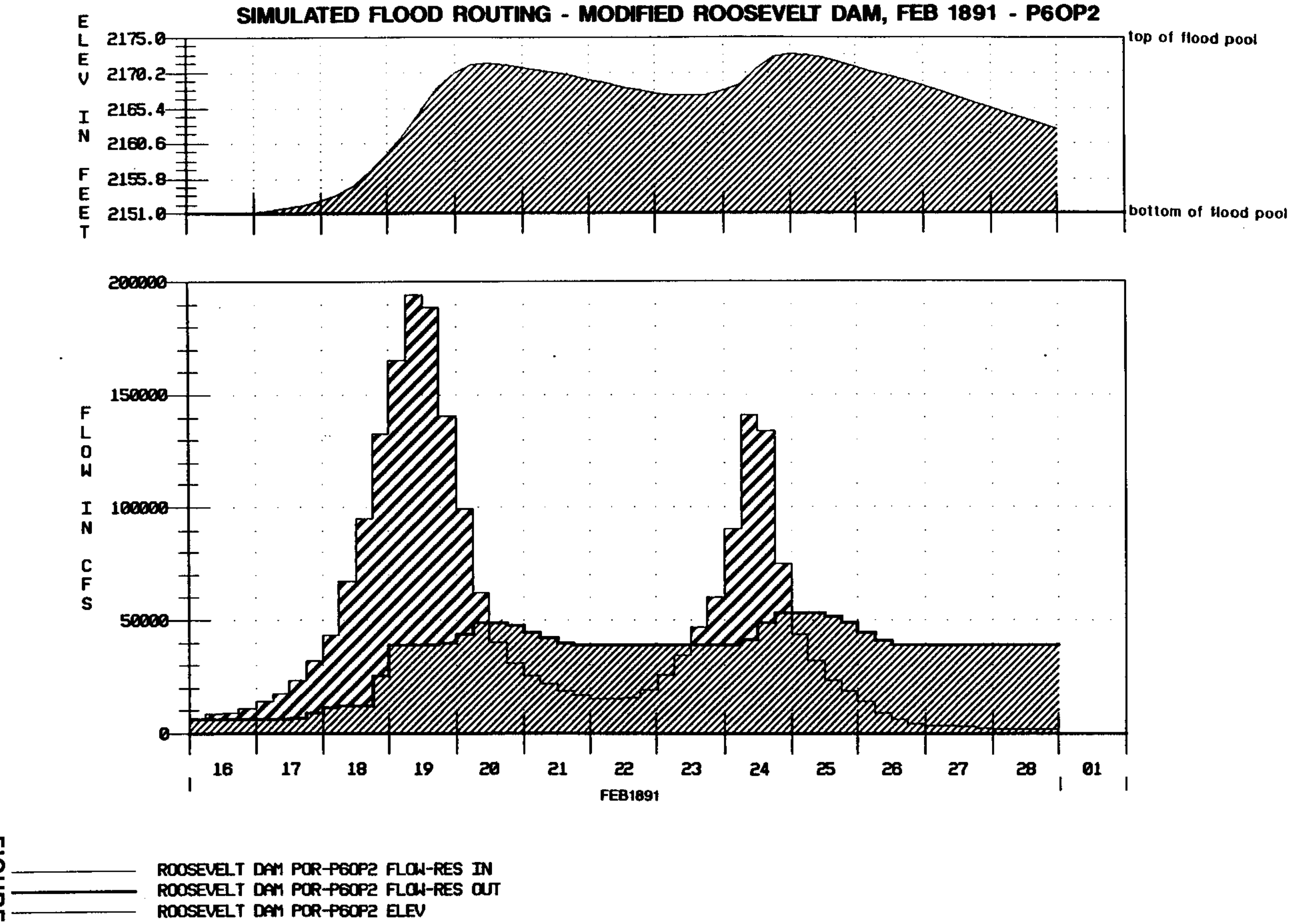
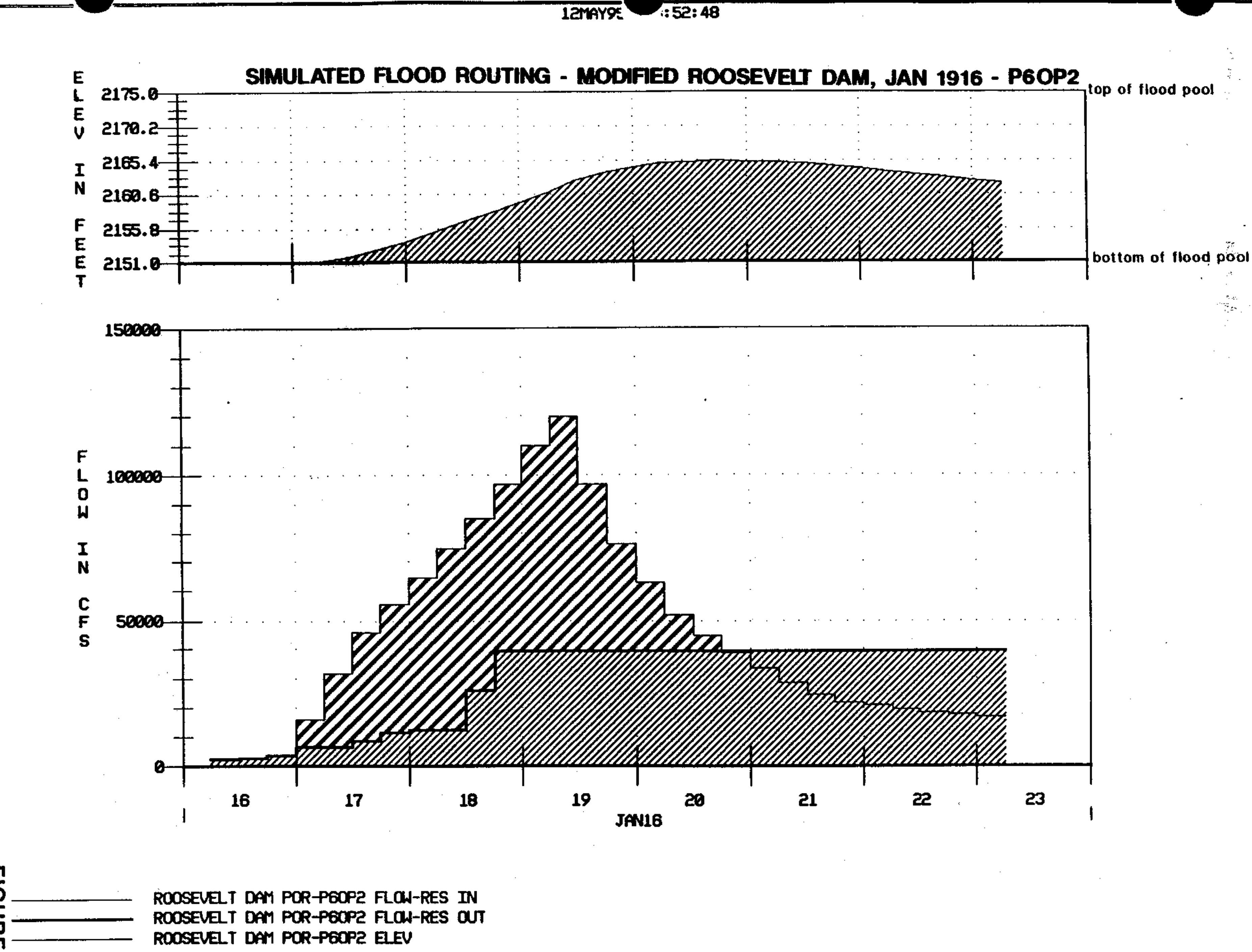


FIGURE 23-3



SIMULATED FLOOD ROUTING - MODIFIED ROOSEVELT DAM, FEB 1891 - P6OP2
ELEV IN FEET
2175.0
2170.2
2165.4
2160.6
2155.8
2151.0
top of flood pool
bottom of flood pool
FLOW IN CFS
200000
150000
100000
50000
0
16 17 18 19 20 21 22 23 24 25 26 27 28 01
FEB1891
ROOSEVELT DAM POR-P6OP2 FLOW-RES IN
ROOSEVELT DAM POR-P6OP2 FLOW-RES OUT
ROOSEVELT DAM POR-P6OP2 ELEV

FIGURE 24-1



12MAY95 :52:48
SIMULATED FLOOD ROUTING - MODIFIED ROOSEVELT DAM, JAN 1916 - P6OP2
ELEV IN FEET
2175.0
2170.2
2165.4
2160.6
2155.8
2151.0
top of flood pool
bottom of flood pool
FLOW IN CFS
150000
100000
50000
0
16
17
18
19
20
21
22
23
JAN16
ROOSEVELT DAM POR-P6OP2 FLOW-RES IN
ROOSEVELT DAM POR-P6OP2 FLOW-RES OUT
ROOSEVELT DAM POR-P6OP2 ELEV

FIGURE 24-2

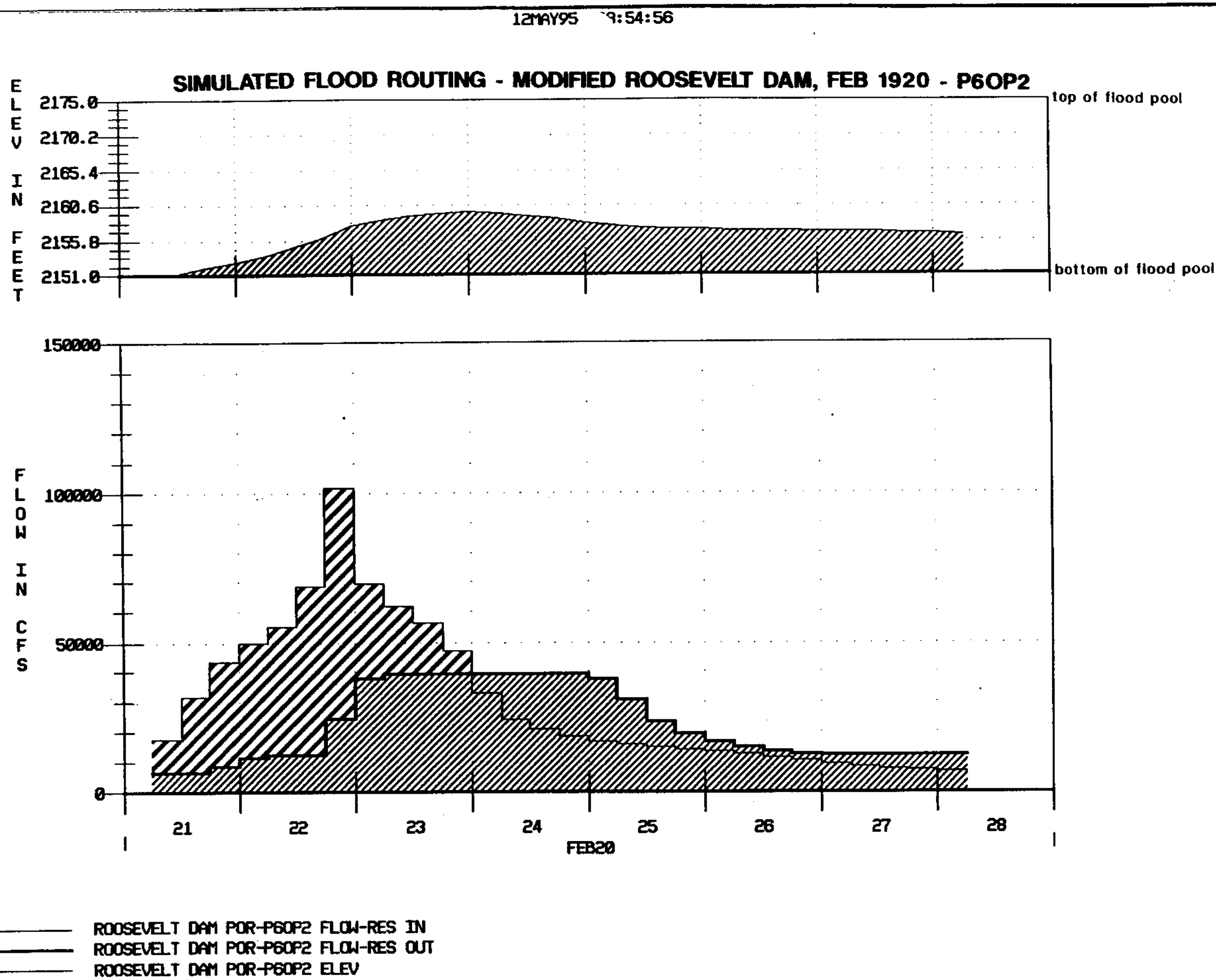

12MAY95 ?9:54:56
SIMULATED FLOOD ROUTING - MODIFIED ROOSEVELT DAM, FEB 1920 - P6OP2
ELEV IN FEET
2175.0
2170.2
2165.4
2160.6
2155.8
2151.0
top of flood pool
bottom of flood pool
FLOW IN CFS
150000
100000
50000
0
21
22
23
24
25
26
27
28
FEB20
ROOSEVELT DAM POR-P6OP2 FLOW-RES IN
ROOSEVELT DAM POR-P6OP2 FLOW-RES OUT
ROOSEVELT DAM POR-P6OP2 ELEV

FIGURE 24-3

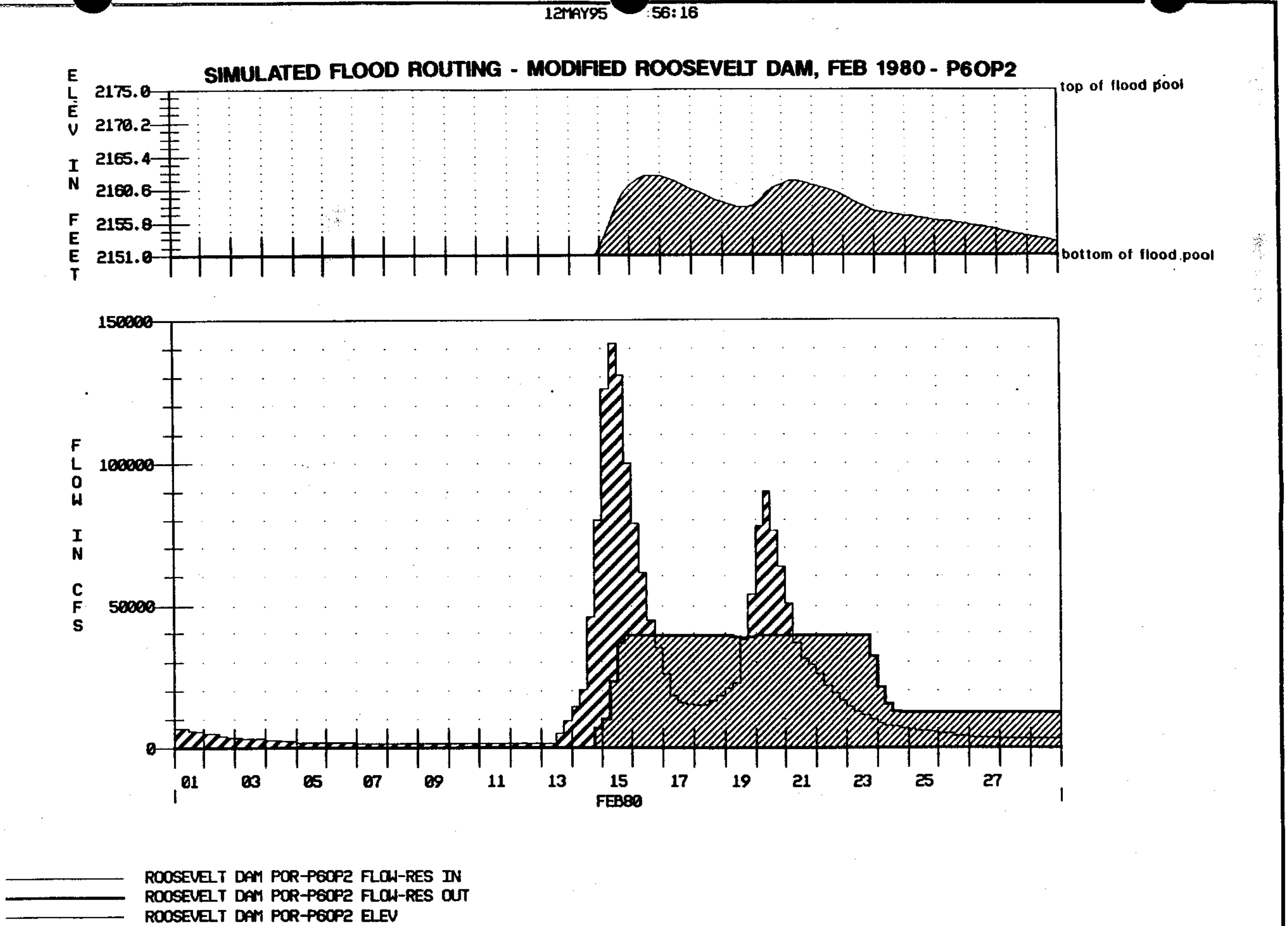
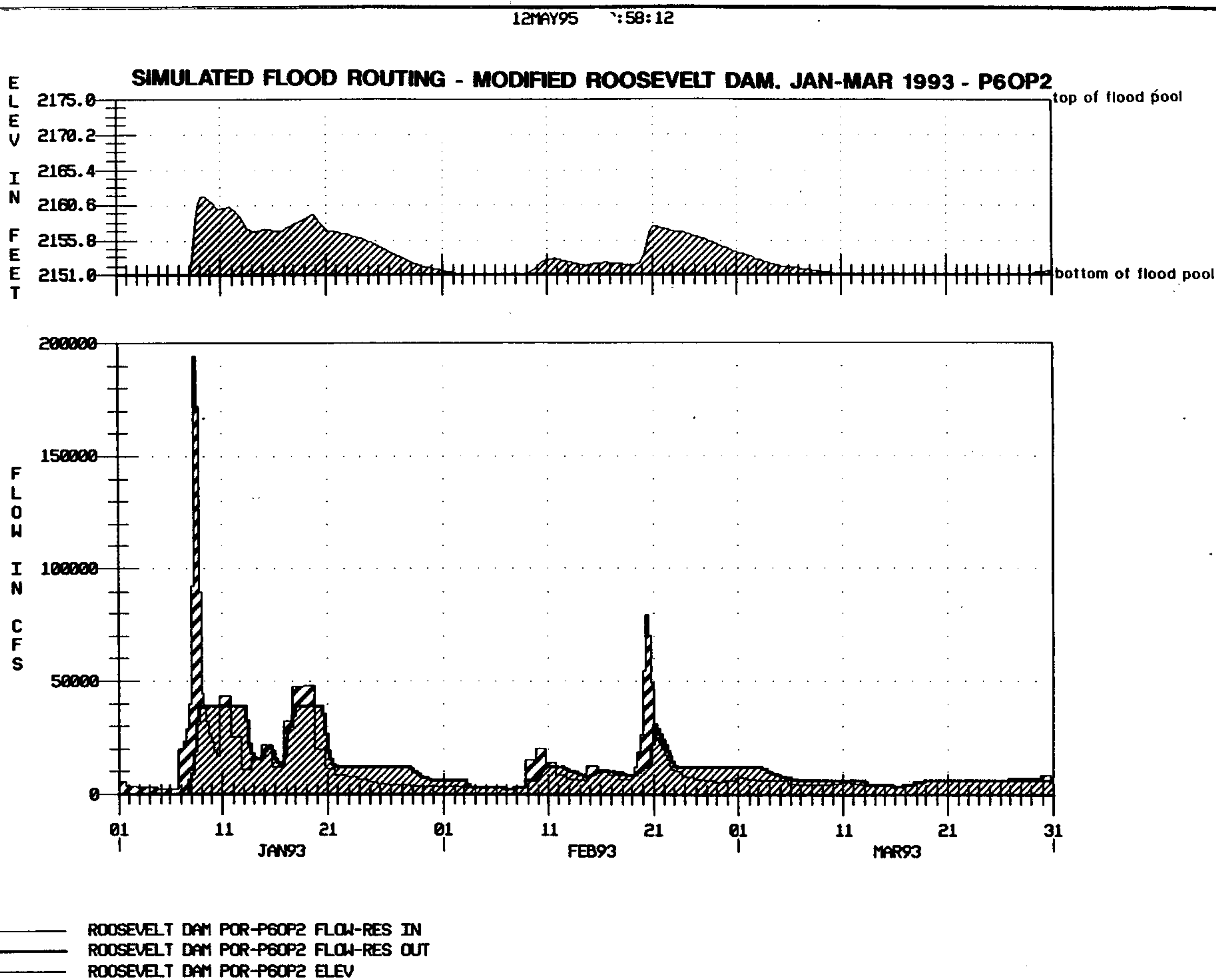

12MAY95 :56:16
SIMULATED FLOOD ROUTING - MODIFIED ROOSEVELT DAM, FEB 1980 - P6OP2
ELEV IN FEET
2175.0
2170.2
2165.4
2160.6
2155.8
2151.0
top of flood pool
bottom of flood pool
FLOW IN CFS
150000
100000
50000
0
01
03
05
07
09
11
13
15
17
19
21
23
25
27
FEB80
ROOSEVELT DAM POR-P6OP2 FLOW-RES IN
ROOSEVELT DAM POR-P6OP2 FLOW-RES OUT
ROOSEVELT DAM POR-P6OP2 ELEV

FIGURE 24-4



12MAY95 ':58:12
SIMULATED FLOOD ROUTING - MODIFIED ROOSEVELT DAM. JAN-MAR 1993 - P6OP2
ELEV IN FEET
2175.0
2170.2
2165.4
2160.6
2155.8
2151.0
top of flood pool
bottom of flood pool
FLOW IN CFS
200000
150000
100000
50000
0
01
11
21
01
11
21
01
11
21
31
JAN93
FEB93
MAR93
ROOSEVELT DAM POR-P6OP2 FLOW-RES IN
ROOSEVELT DAM POR-P6OP2 FLOW-RES OUT
ROOSEVELT DAM POR-P6OP2 ELEV

FIGURE 24-5

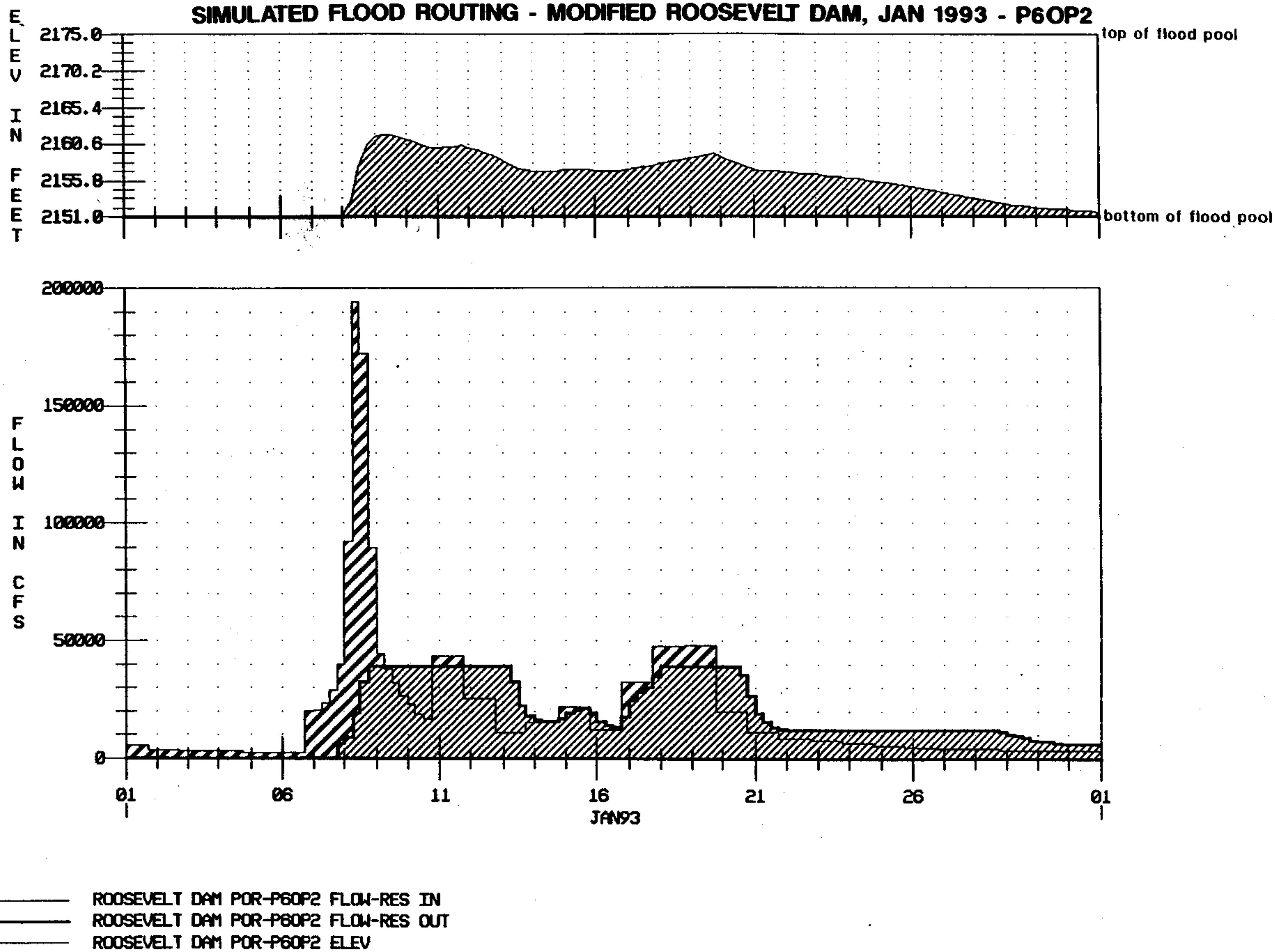

SIMULATED FLOOD ROUTING - MODIFIED ROOSEVELT DAM, JAN 1993 - P6OP2
ELEV IN FEET
2175.0
2170.2
2165.4
2160.6
2155.8
2151.0
top of flood pool
bottom of flood pool
FLOW IN CFS
200000
150000
100000
50000
0
01
06
11
16
21
26
01
JAN93
ROOSEVELT DAM POR-P6OP2 FLOW-RES IN
ROOSEVELT DAM POR-P6OP2 FLOW-RES OUT
ROOSEVELT DAM POR-P6OP2 ELEV

FIGURE 24-6

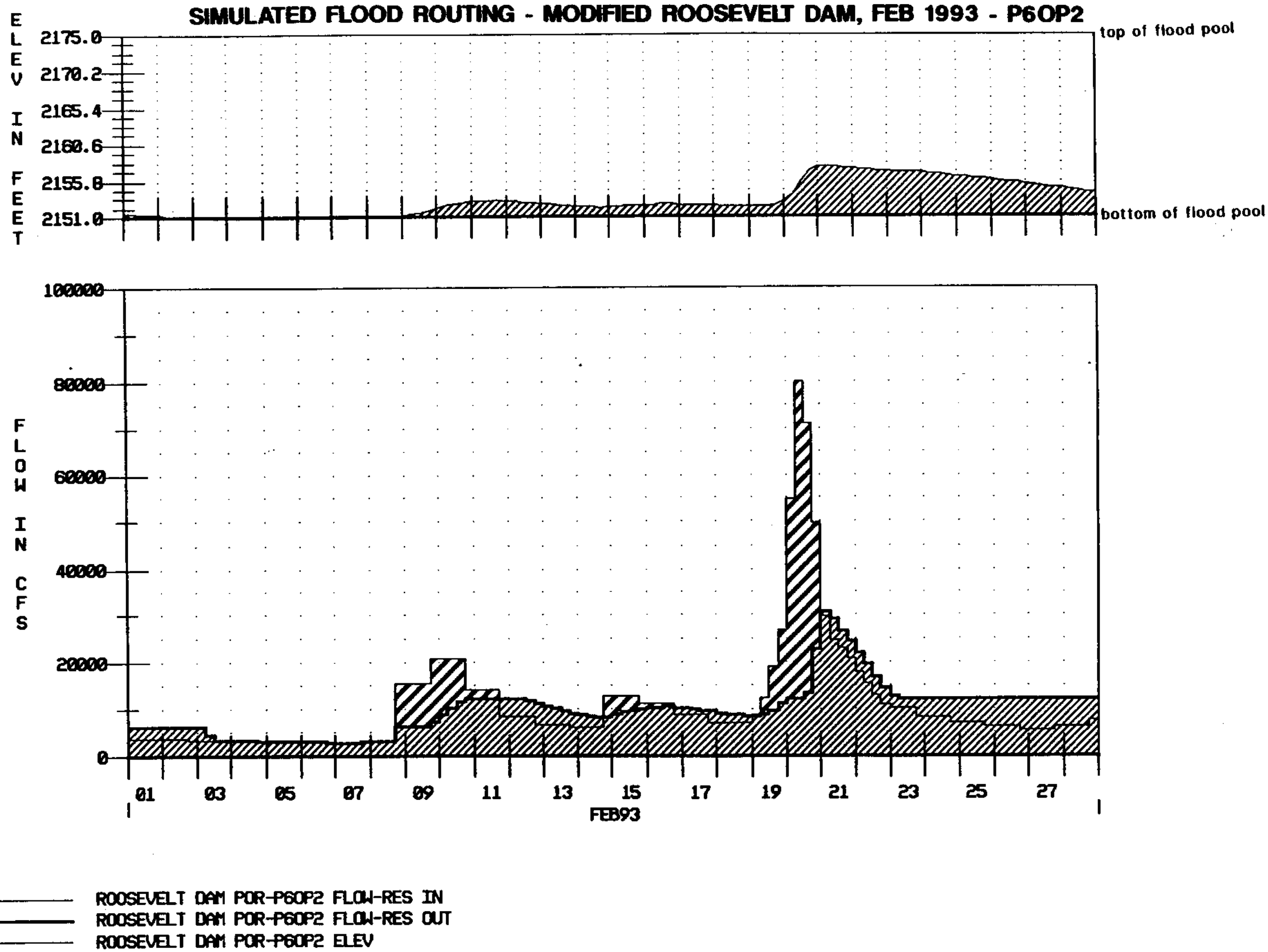

SIMULATED FLOOD ROUTING - MODIFIED ROOSEVELT DAM, FEB 1993 - P6OP2
ELEV IN FEET
2175.0
2170.2
2165.4
2160.6
2155.8
2151.0
top of flood pool
bottom of flood pool
FLOW IN CFS
100000
80000
60000
40000
20000
0
01
03
05
07
09
11
13
15
17
19
21
23
25
27
FEB93
ROOSEVELT DAM POR-P6OP2 FLOW-RES IN
ROOSEVELT DAM POR-P6OP2 FLOW-RES OUT
ROOSEVELT DAM POR-P6OP2 ELEV

FIGURE 24-7

31MAY95 :19:08

BALANCED HYDROGRAPH ROUTING AT MODIFIED ROOSEVELT DAM
100-YR FLOOD ● P925K

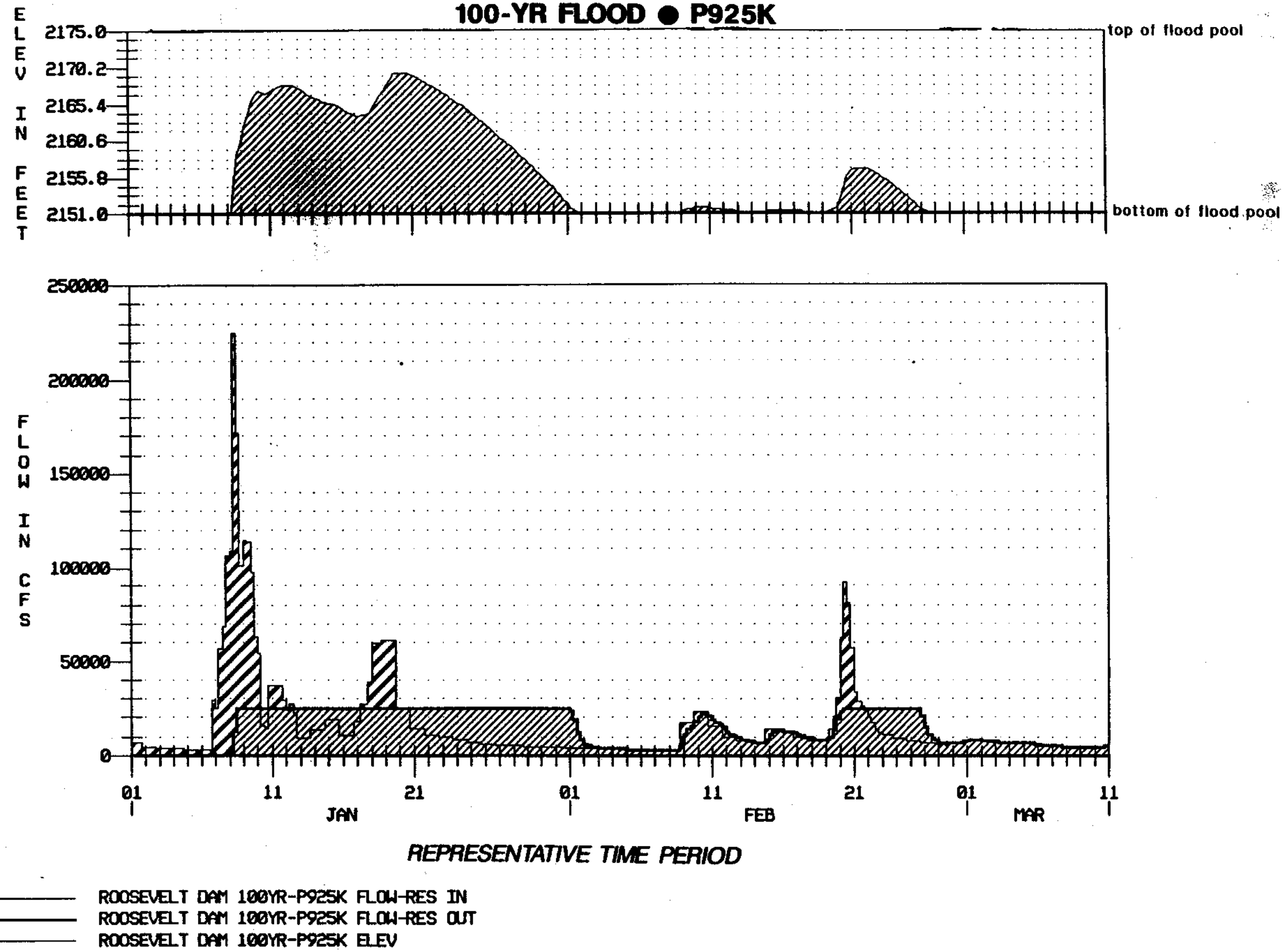


FIGURE 25-1

31MAY95 [illegible]:24:53

BALANCED HYDROGRAPH ROUTIN[illegible] AT MODIFIED ROOSEVELT DAM
200-YR FLOOD ● P925K

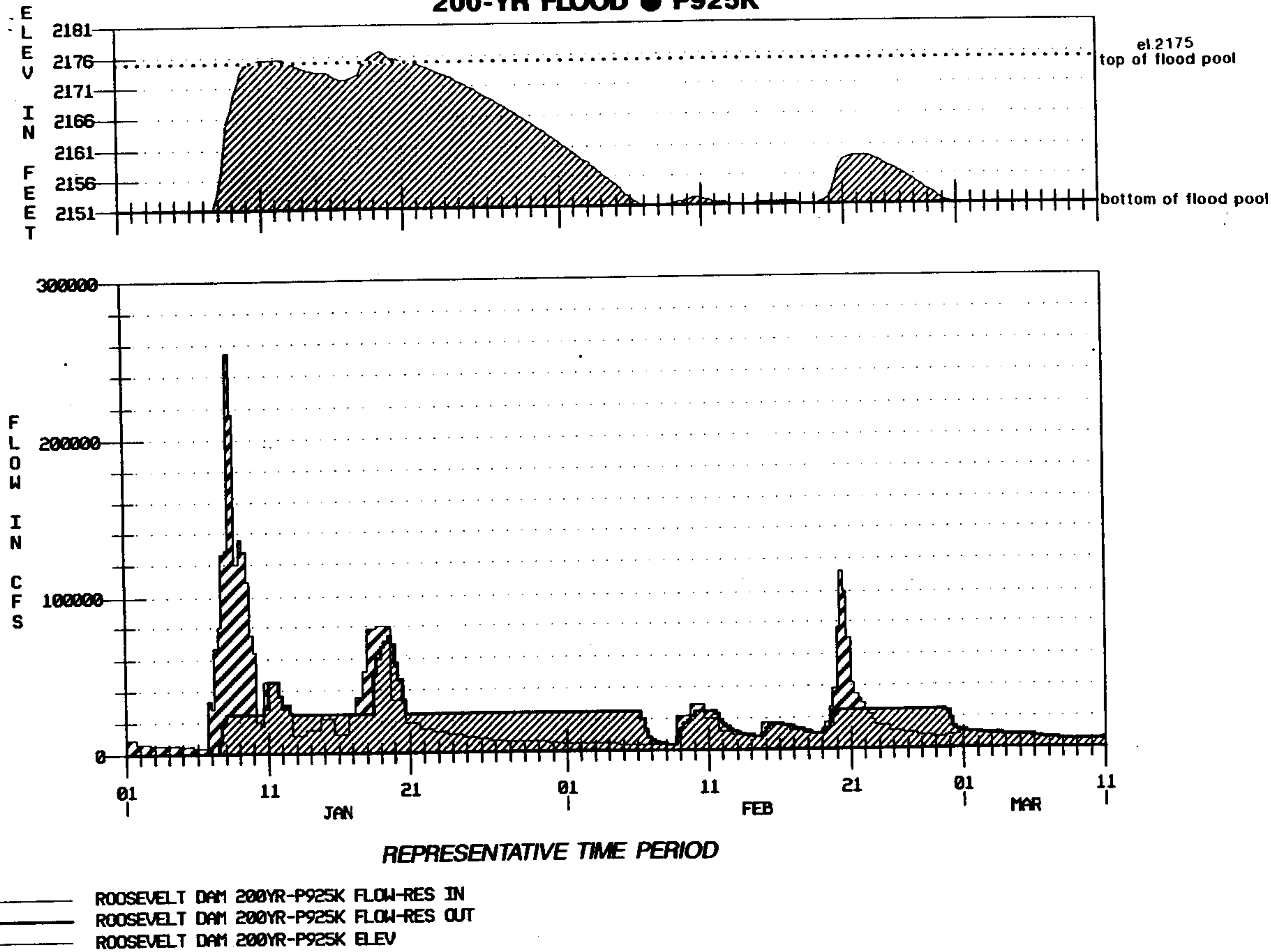


FIGURE 25-2

21JUN9[illegible]:43:08

BALANCED HYDROGRAPH ROUTING AT MODIFIED ROOSEVELT DAM

500-YR FLOOD ● P925K

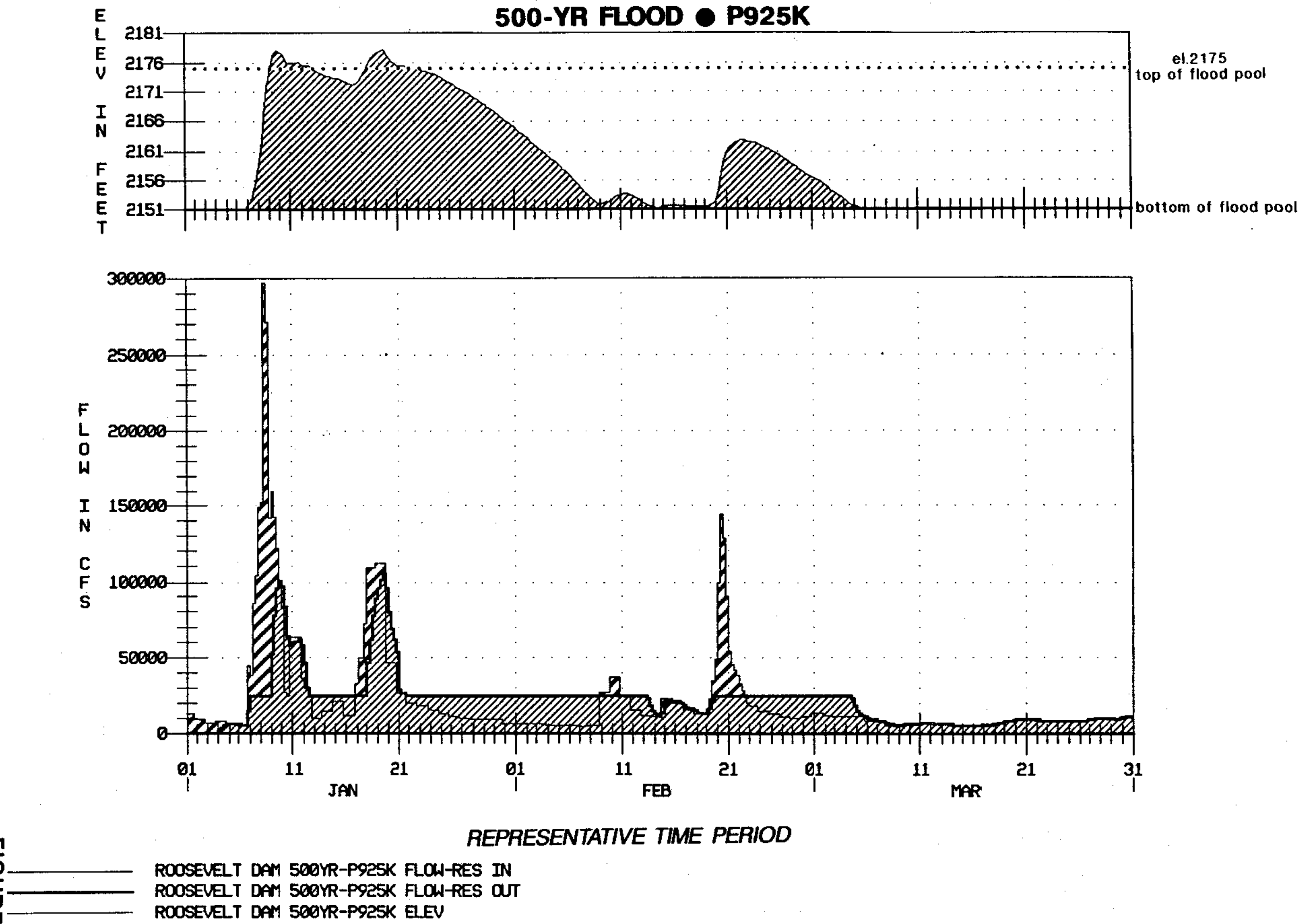


FIGURE 25-3

21JUN95 :50:29

BALANCED HYDROGRAPH ROUTIN.. AT MODIFIED ROOSEVELT DAM
100-YR FLOOD ● P9OP1

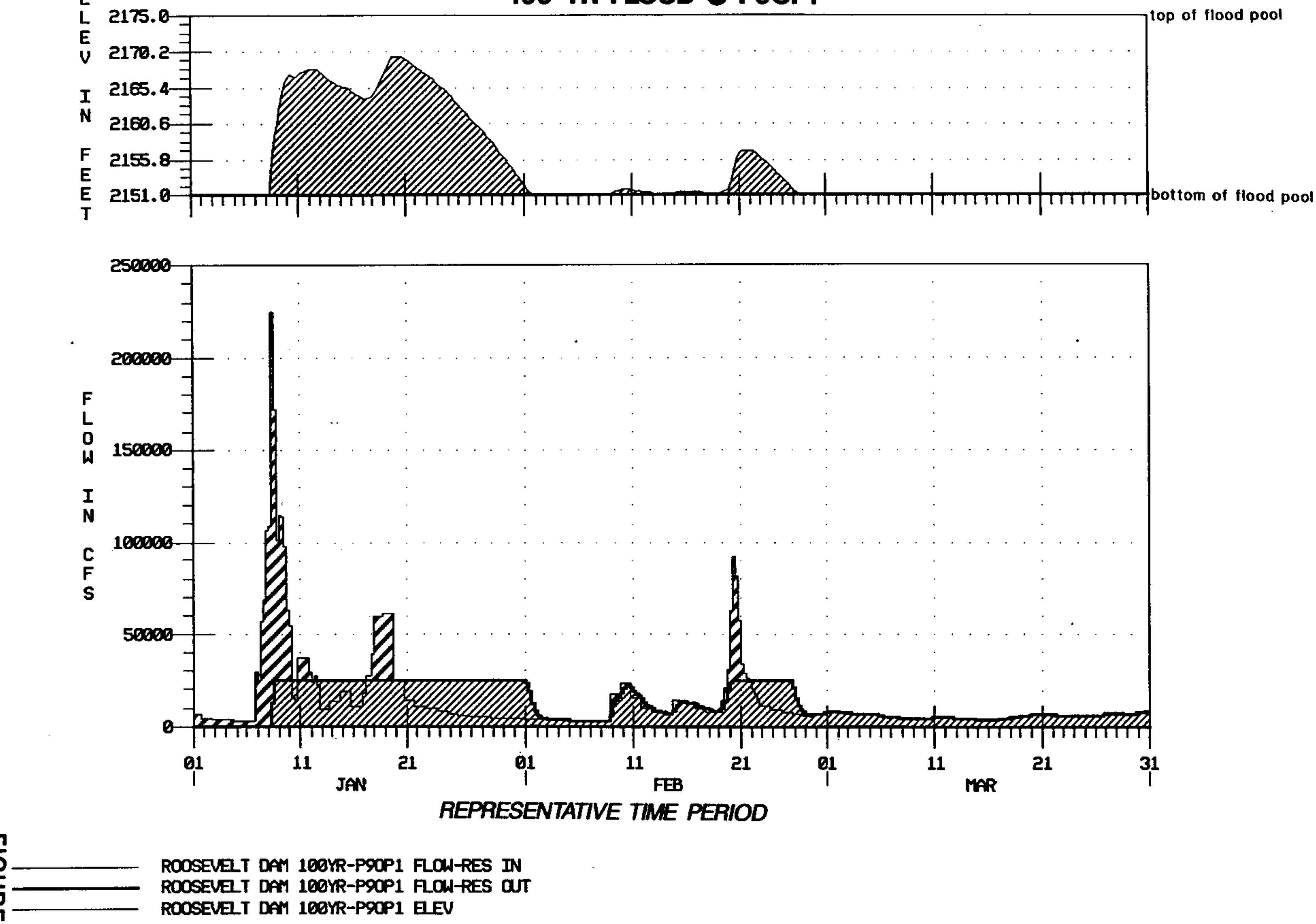


FIGURE 26-1

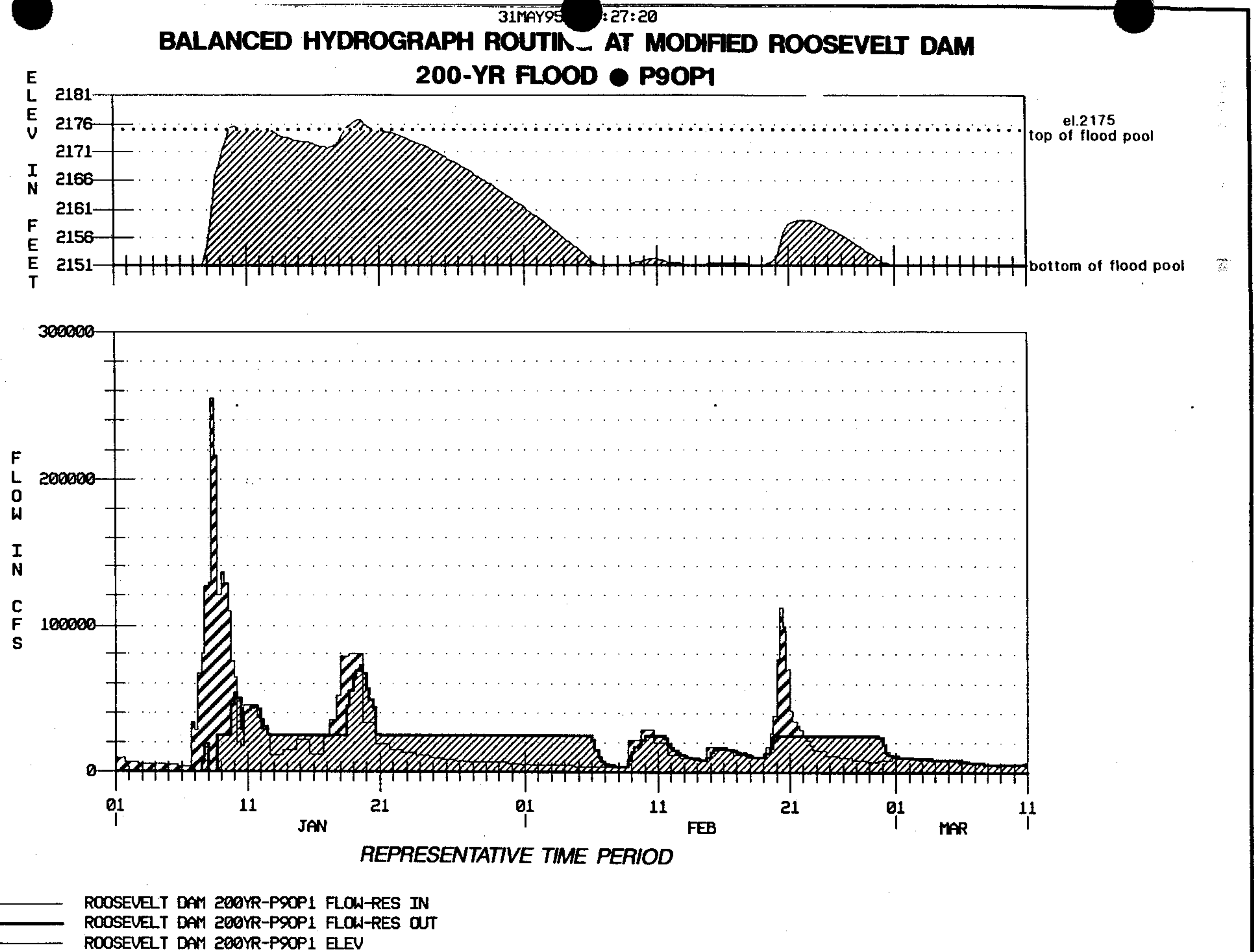

31MAY95 :27:20
BALANCED HYDROGRAPH ROUTIN AT MODIFIED ROOSEVELT DAM
200-YR FLOOD ● P9OP1
ELEV IN FEET
2181
2176
2171
2166
2161
2156
2151
el.2175
top of flood pool
bottom of flood pool
FLOW IN CFS
300000
200000
100000
0
01
11
21
01
11
21
01
11
JAN
FEB
MAR
REPRESENTATIVE TIME PERIOD
ROOSEVELT DAM 200YR-P9OP1 FLOW-RES IN
ROOSEVELT DAM 200YR-P9OP1 FLOW-RES OUT
ROOSEVELT DAM 200YR-P9OP1 ELEV

FIGURE 26-2

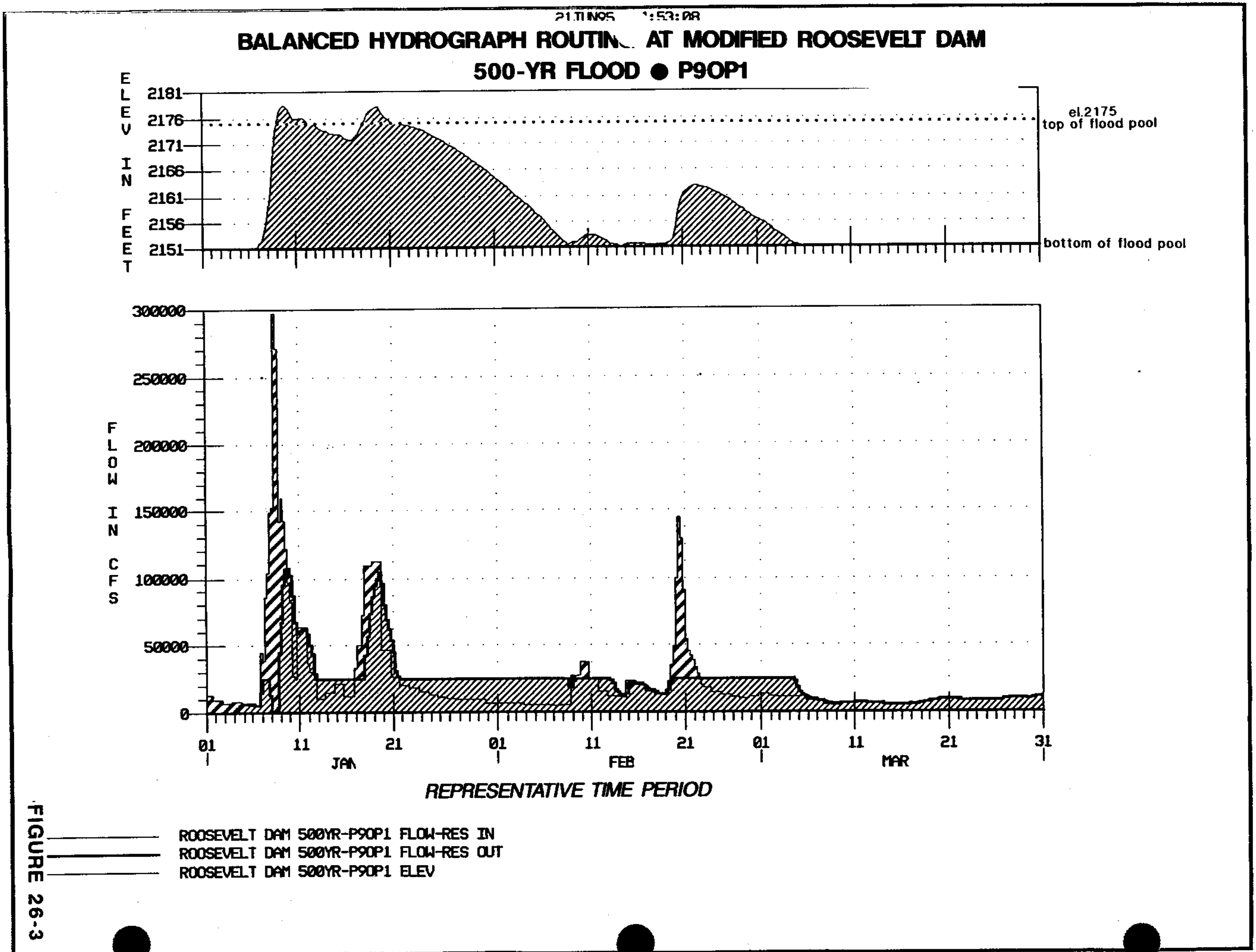

21JUN95 :53:08
BALANCED HYDROGRAPH ROUTIN AT MODIFIED ROOSEVELT DAM
500-YR FLOOD ● P9OP1
ELEV IN FEET
2181
2176
2171
2166
2161
2156
2151
el.2175
top of flood pool
bottom of flood pool
FLOW IN CFS
300000
250000
200000
150000
100000
50000
0
01
11
21
01
11
21
01
11
21
31
JAN
FEB
MAR
REPRESENTATIVE TIME PERIOD
ROOSEVELT DAM 500YR-P9OP1 FLOW-RES IN
ROOSEVELT DAM 500YR-P9OP1 FLOW-RES OUT
ROOSEVELT DAM 500YR-P9OP1 ELEV

FIGURE 26-3

21JUN95 :57:13

BALANCED HYDROGRAPH ROUTING AT MODIFIED ROOSEVELT DAM
100 -YR FLOOD ● P6OP1

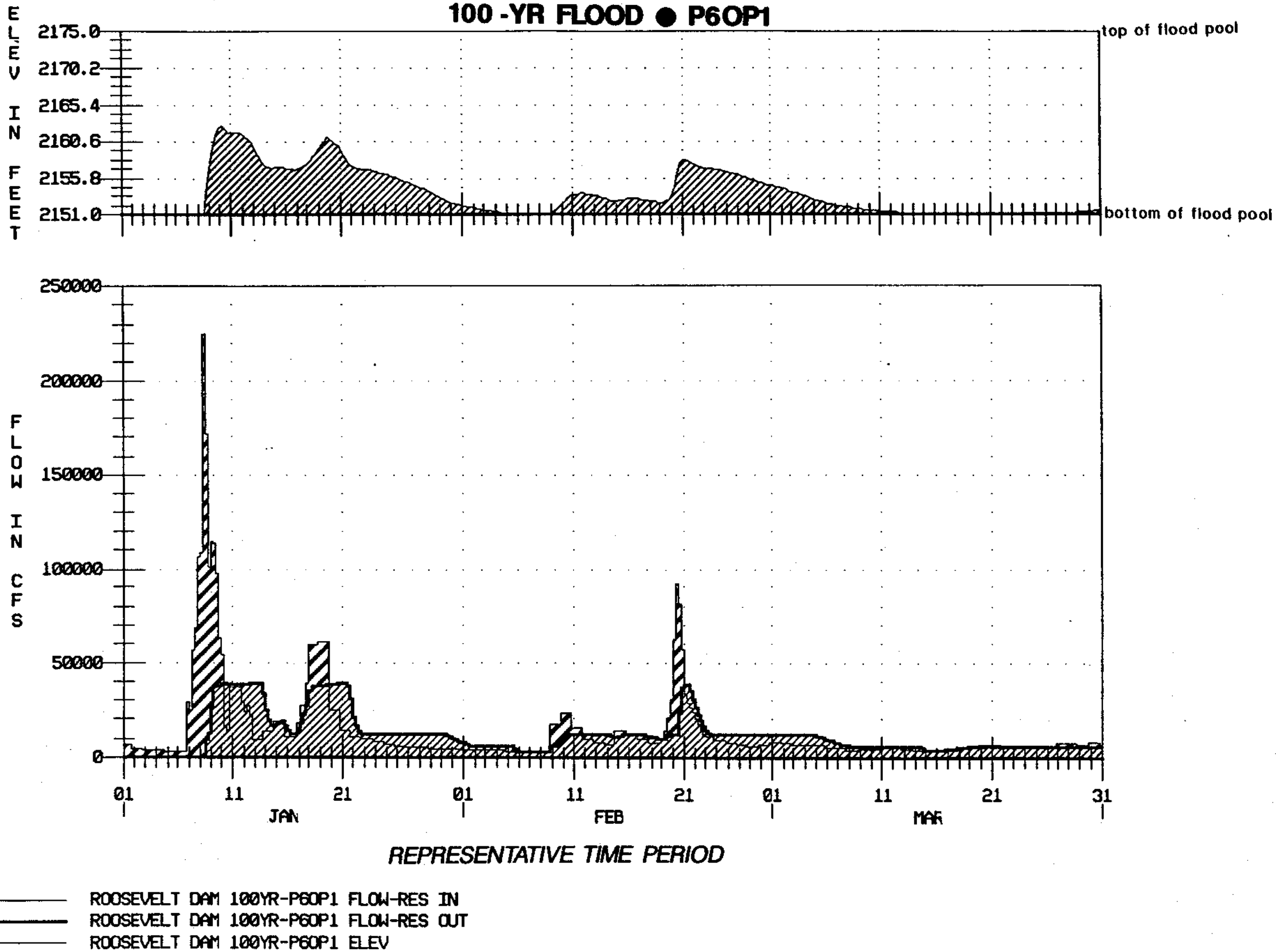
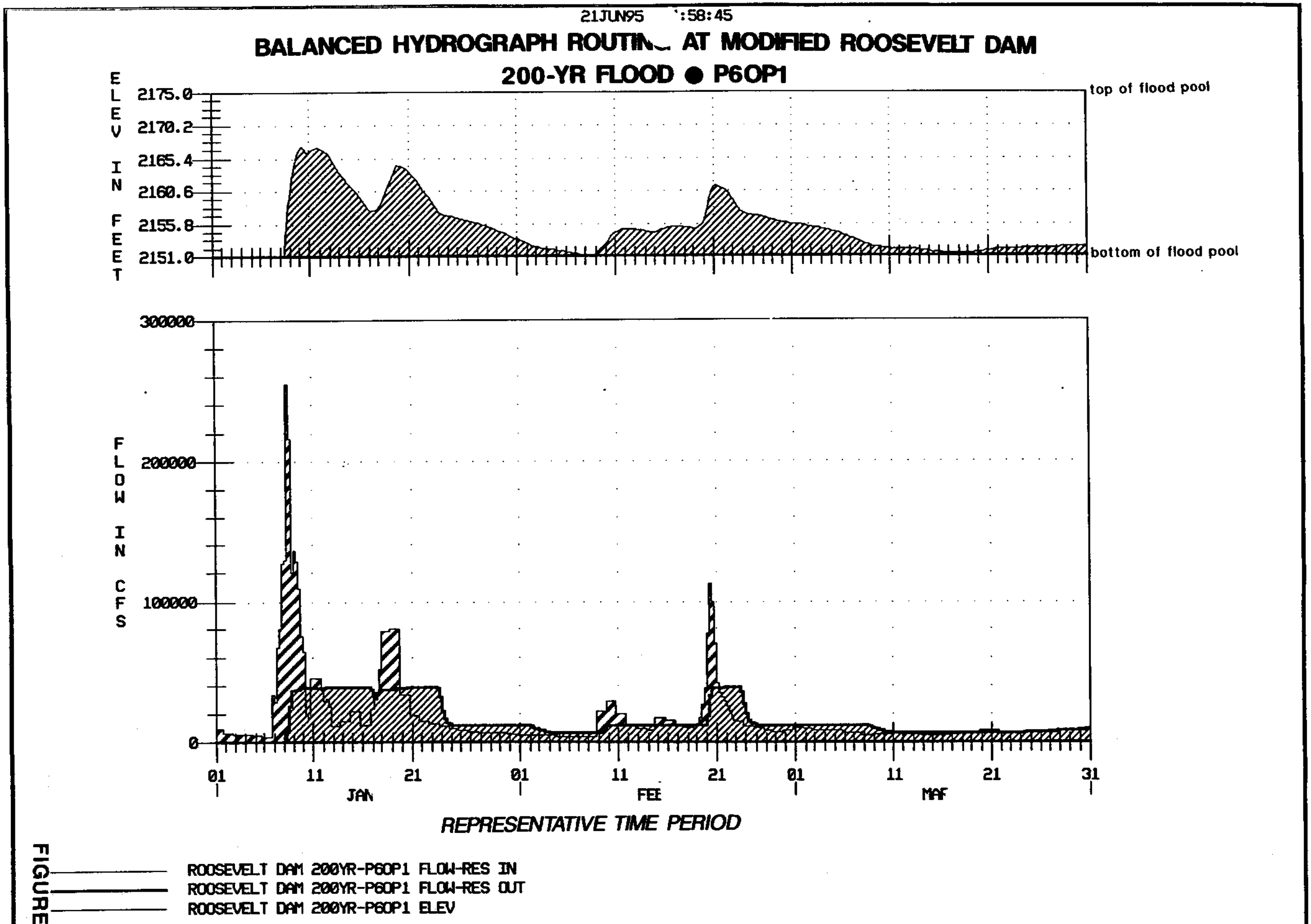
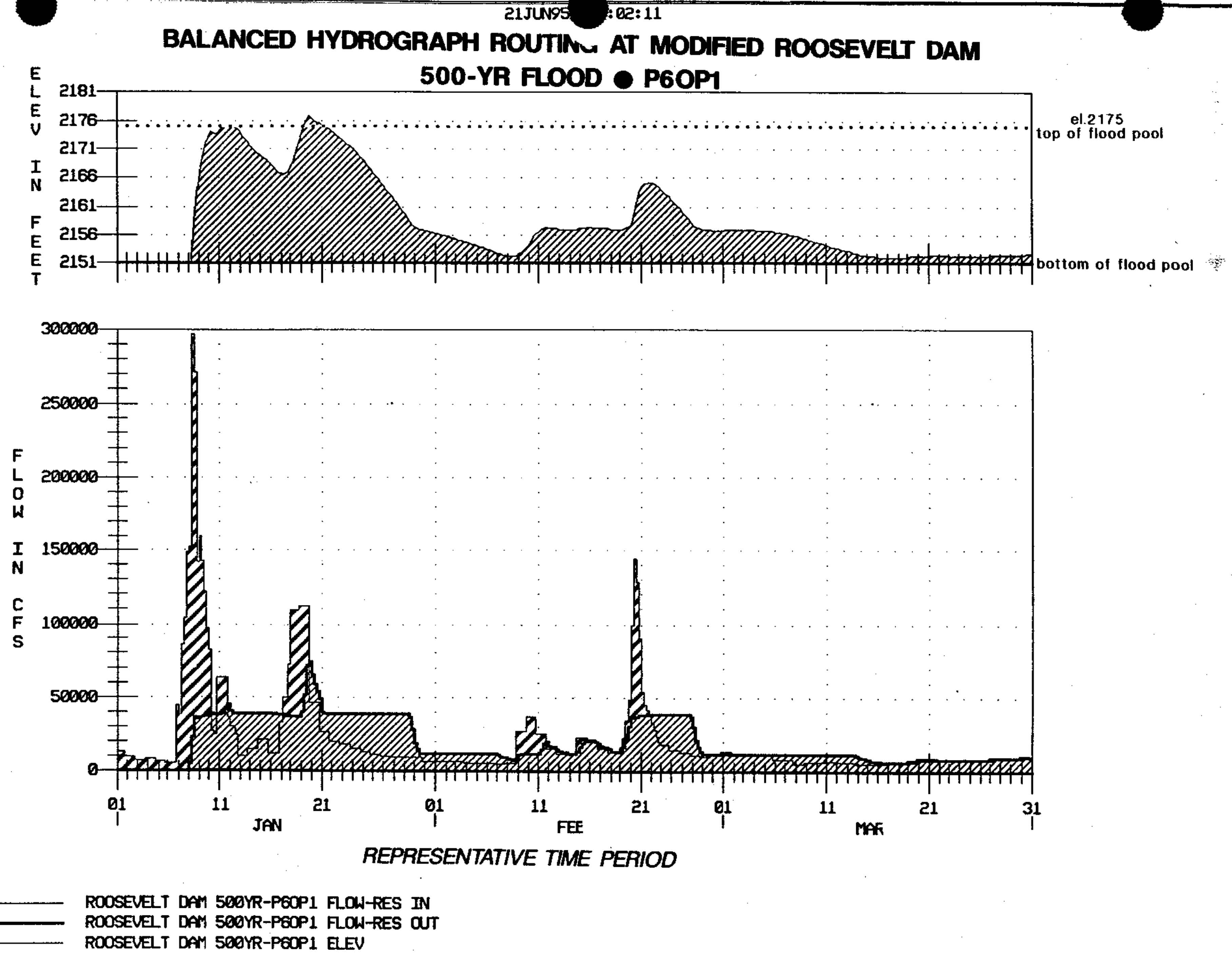


FIGURE 27-1



21JUN95 ·:58:45
BALANCED HYDROGRAPH ROUTIN.. AT MODIFIED ROOSEVELT DAM
200-YR FLOOD ● P6OP1
ELEV IN FEET
2175.0
2170.2
2165.4
2160.6
2155.8
2151.0
top of flood pool
bottom of flood pool
FLOW IN CFS
300000
200000
100000
0
01
11
21
01
11
21
01
11
21
31
JAN
FEE
MAF
REPRESENTATIVE TIME PERIOD
ROOSEVELT DAM 200YR-P6OP1 FLOW-RES IN
ROOSEVELT DAM 200YR-P6OP1 FLOW-RES OUT
ROOSEVELT DAM 200YR-P6OP1 ELEV

FIGURE 27-2



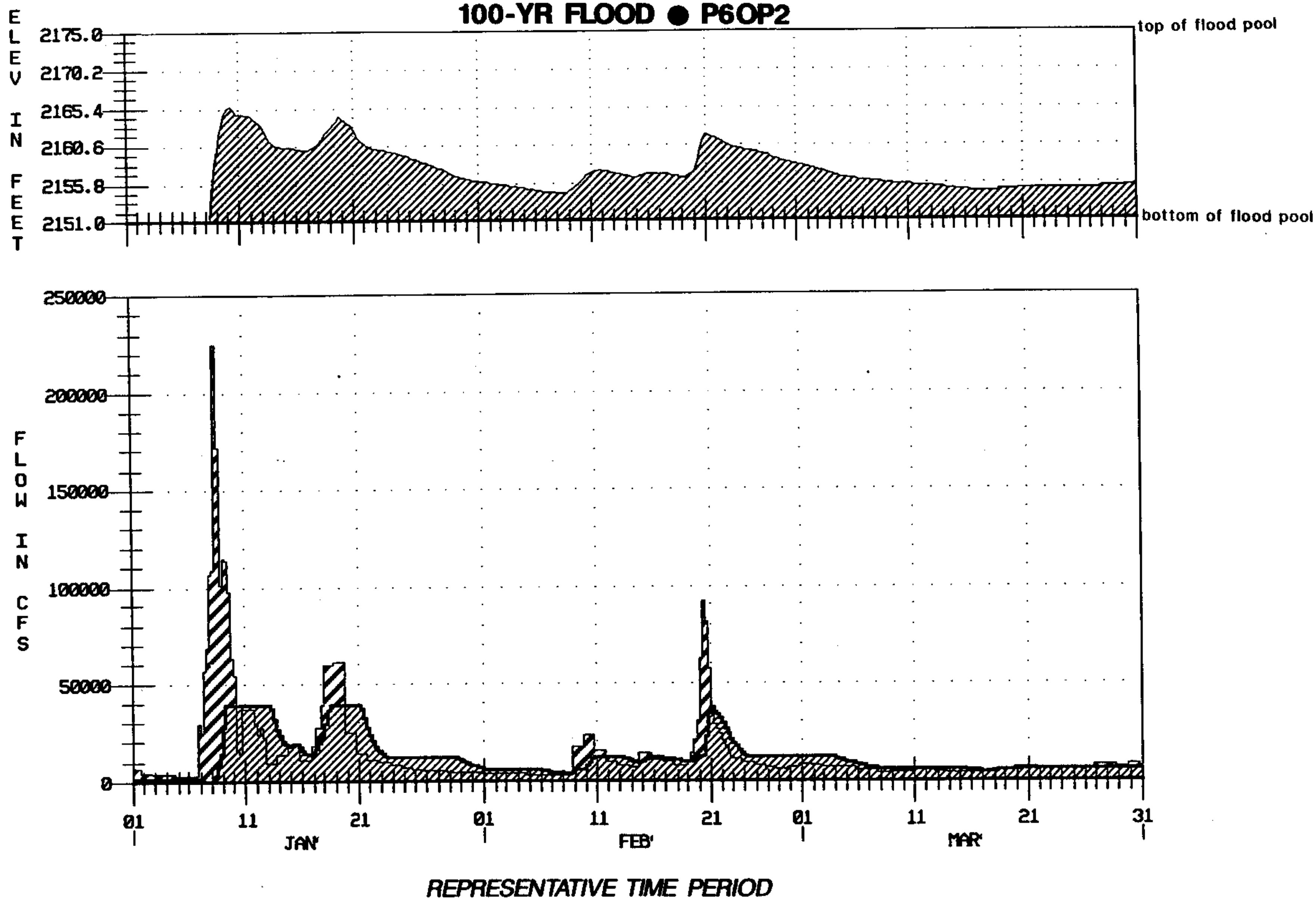
21JUN95 :02:11
BALANCED HYDROGRAPH ROUTING AT MODIFIED ROOSEVELT DAM
500-YR FLOOD ● P6OP1
ELEV IN FEET
2181
2176
2171
2166
2161
2156
2151
el.2175
top of flood pool
bottom of flood pool
FLOW IN CFS
300000
250000
200000
150000
100000
50000
0
01
11
21
01
11
21
01
11
21
31
JAN
FEB
MAR
REPRESENTATIVE TIME PERIOD
ROOSEVELT DAM 500YR-P6OP1 FLOW-RES IN
ROOSEVELT DAM 500YR-P6OP1 FLOW-RES OUT
ROOSEVELT DAM 500YR-P6OP1 ELEV

FIGURE 27-3

12MAY95 :22:34

BALANCED HYDROGRAPH ROUTING AT MODIFIED ROOSEVELT DAM

100-YR FLOOD ● P6OP2



ROOSEVELT DAM 100YR-P6OP2 FLOW-RES IN

ROOSEVELT DAM 100YR-P6OP2 FLOW-RES OUT

ROOSEVELT DAM 100YR-P6OP2 ELEV

FIGURE 28-1

31MAY95 :19:15

BALANCED HYDROGRAPH ROUTING AT MODIFIED ROOSEVELT DAM

200-YR FLOOD ● P6OP2

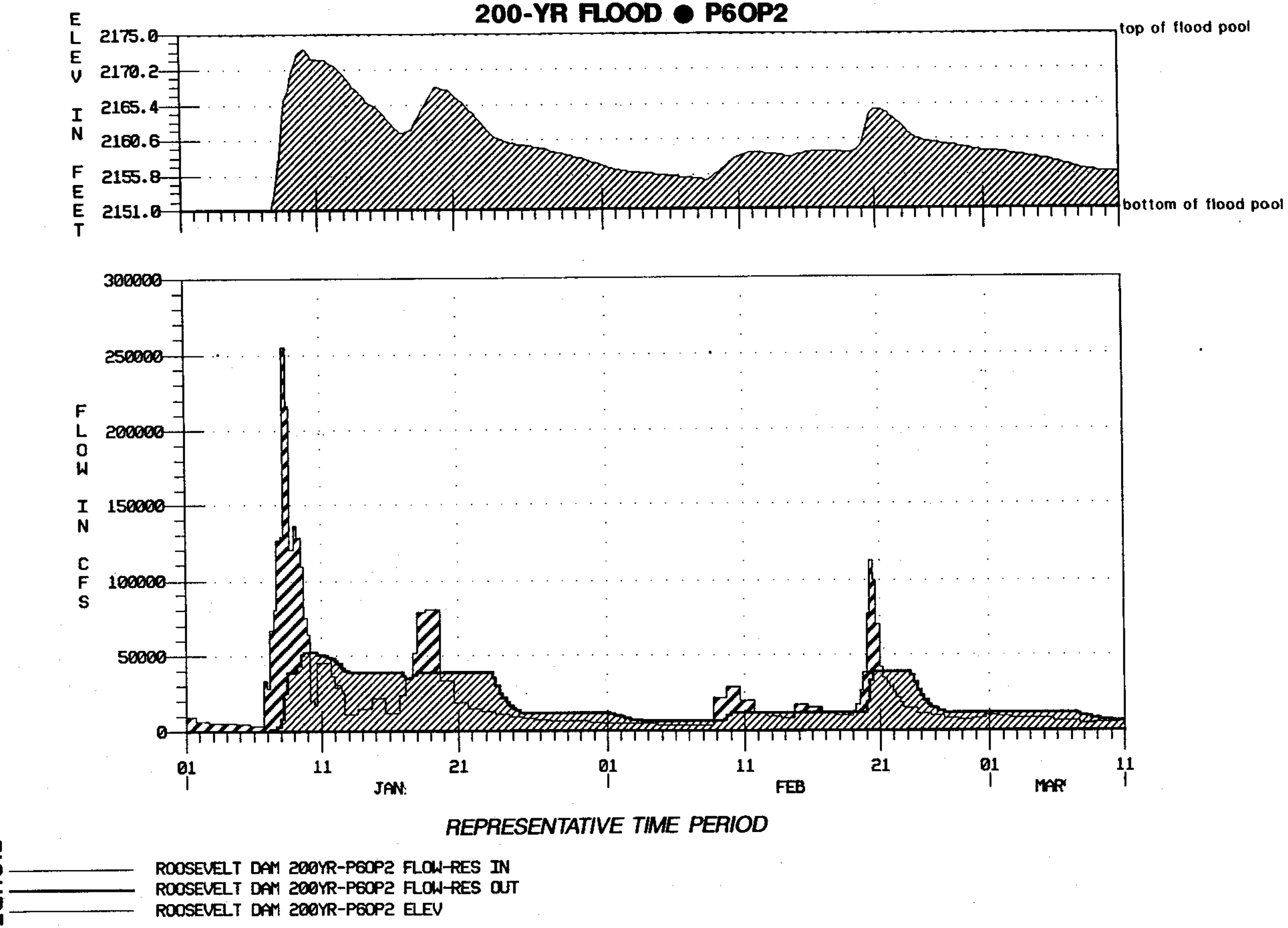
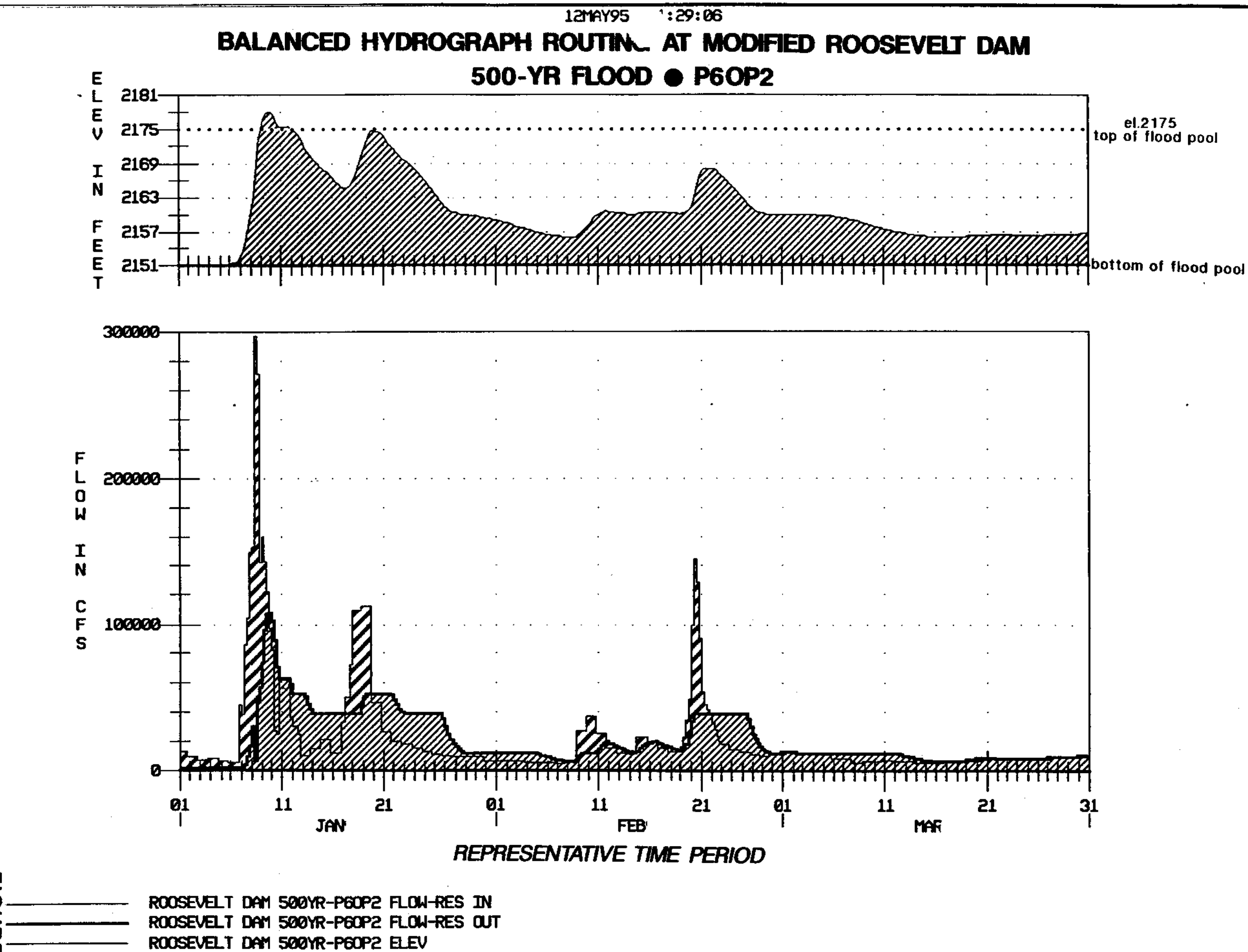


FIGURE 28-2



12MAY95 ':29:06
BALANCED HYDROGRAPH ROUTIN. AT MODIFIED ROOSEVELT DAM
500-YR FLOOD ● P6OP2
ELEV IN FEET
2181
2175
2169
2163
2157
2151
el.2175
top of flood pool
bottom of flood pool
FLOW IN CFS
300000
200000
100000
0
01
11
21
01
11
21
01
11
21
31
JAN
FEB
MAR
REPRESENTATIVE TIME PERIOD
ROOSEVELT DAM 500YR-P6OP2 FLOW-RES IN
ROOSEVELT DAM 500YR-P6OP2 FLOW-RES OUT
ROOSEVELT DAM 500YR-P6OP2 ELEV

FIGURE 28-3

07FEB95 [illegible]:14:55

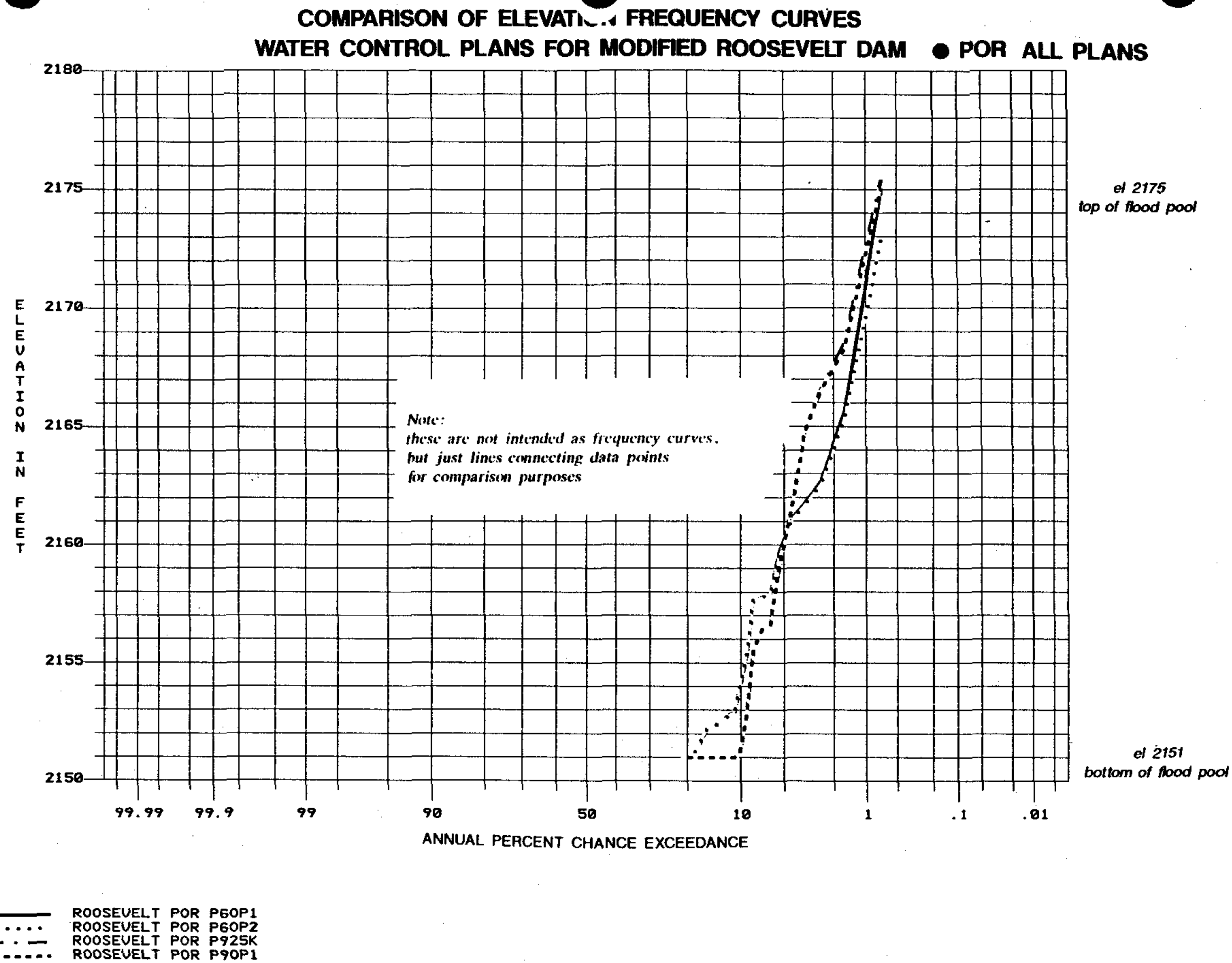


FIGURE 29-1

08FEB95 ..:56:41

COMPARISON OF ELEVA...ON FREQUENCY DATA
WATER CONTROL PLANS FOR MODIFIED ROOSEVELT DAM ● POR - P6OP2/P925K

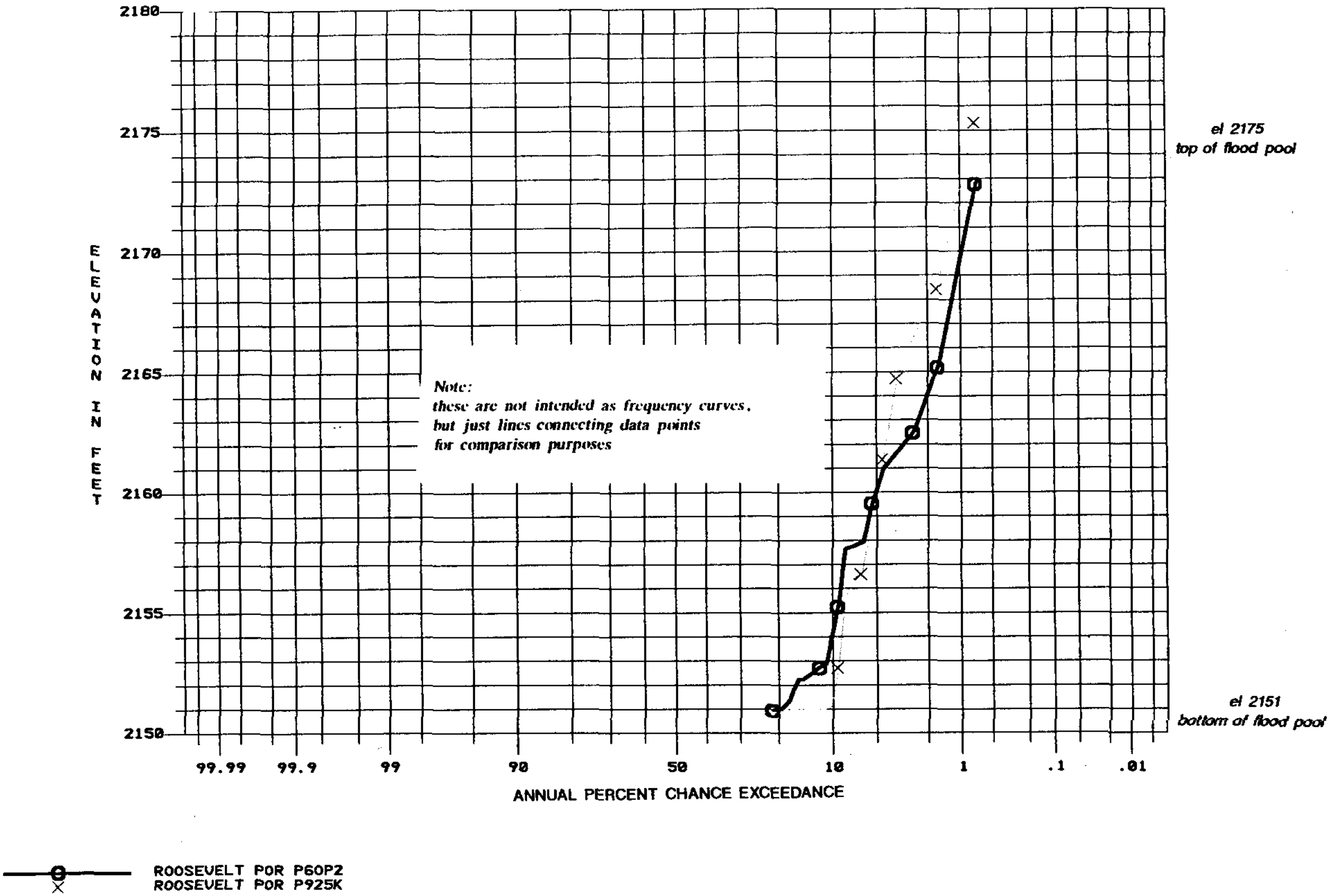


FIGURE 29-2

08FEB95 [illegible] 59:08

COMPARISON OF ELEVATI[illegible] FREQUENCY DATA
WATER CONTROL PLANS FOR MODIFIED ROOSEVELT DAM ● POR - P6OP2/P9OP1

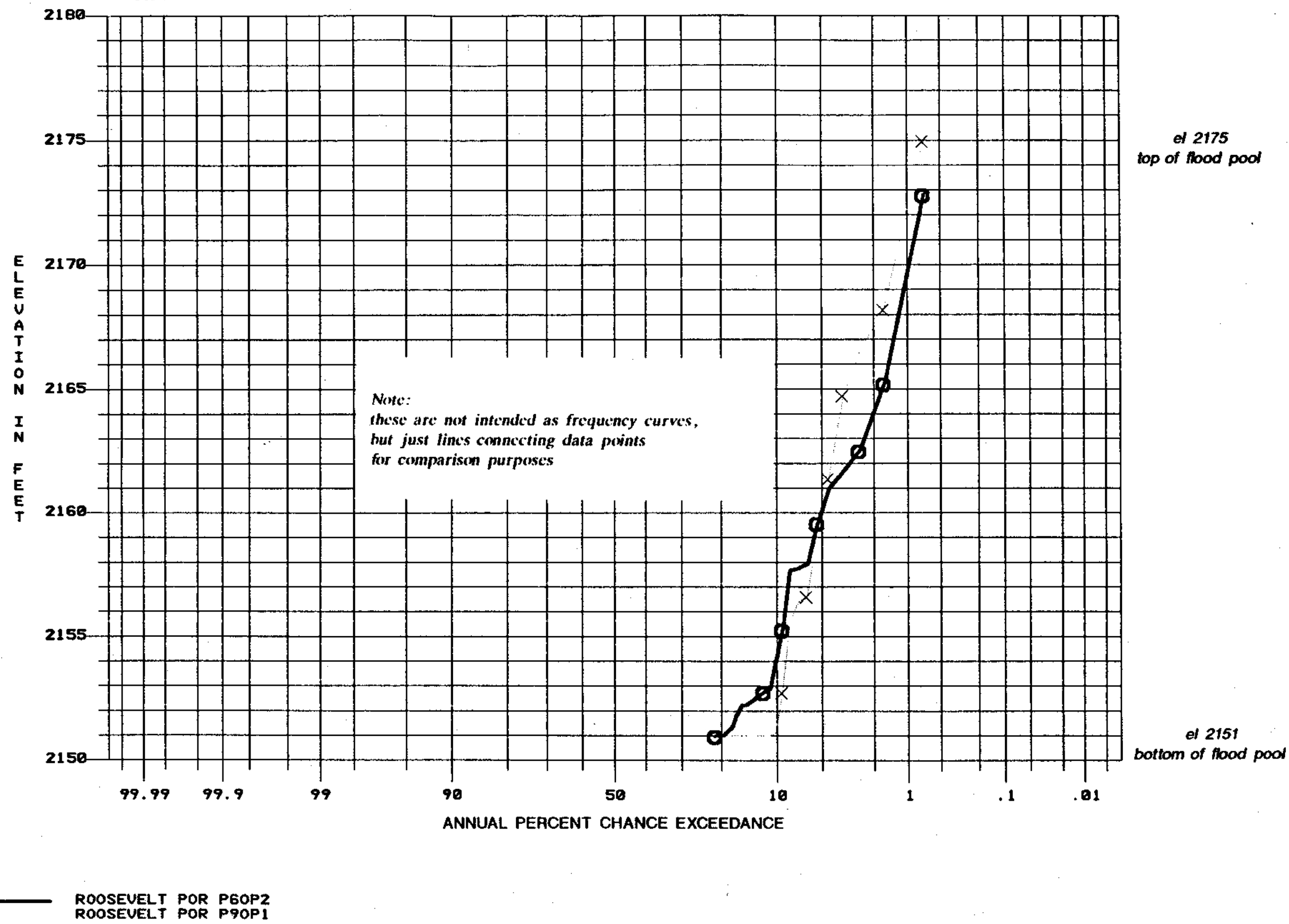


FIGURE 29-3

08FEB95 10:54:42

COMPARISON OF ELEVATIC.. FREQUENCY DATA
WATER CONTROL PLANS FOR MODIFIED ROOSEVELT DAM ● POR - P6OP2/P6OP1

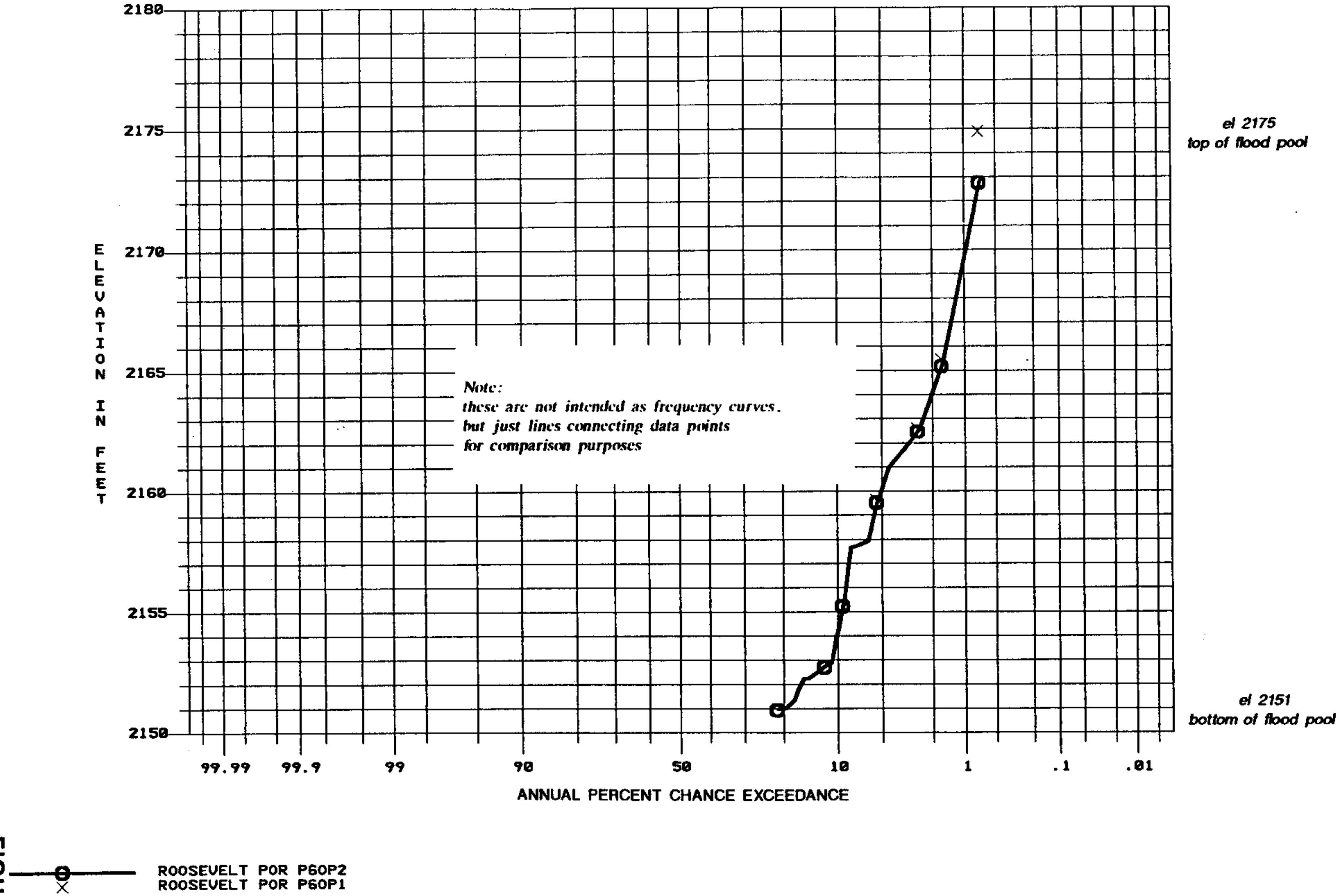


FIGURE 29-4

08FEB95 09:18:22

COMPARISON OF PEAK DISCHARGE FREQUENCY INFORMATION
SALT RIVER AT MODIFIED ROOSEVELT DAM
BHF'S ● P6OP2/P925K

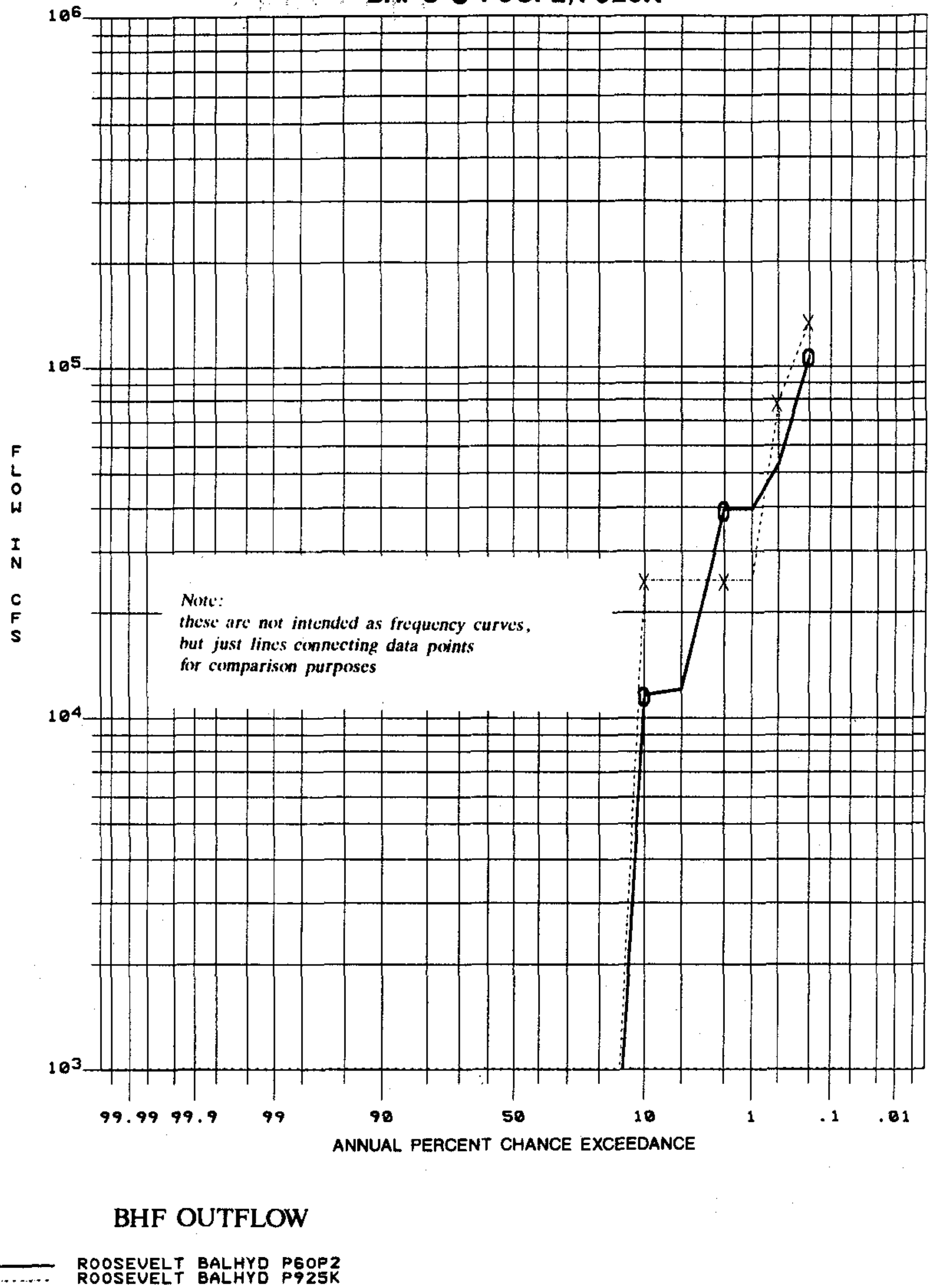


FIGURE 30-1

COMPARISON OF PEAK DISCHARGE FREQUENCY INFORMATION
SALT RIVER AT MODIFIED ROOSEVELT DAM
BHF'S ● P6OP2/P9OP1

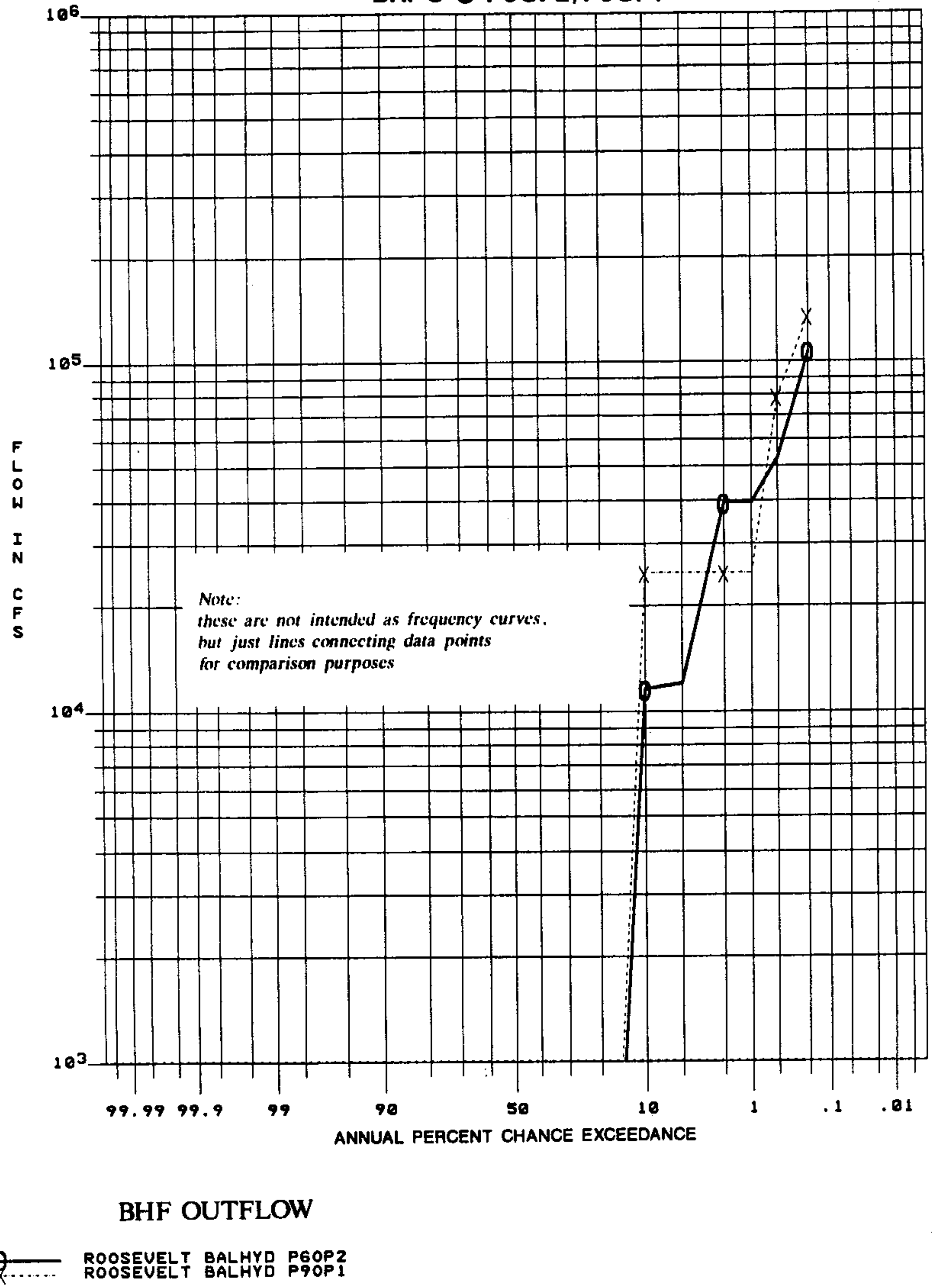
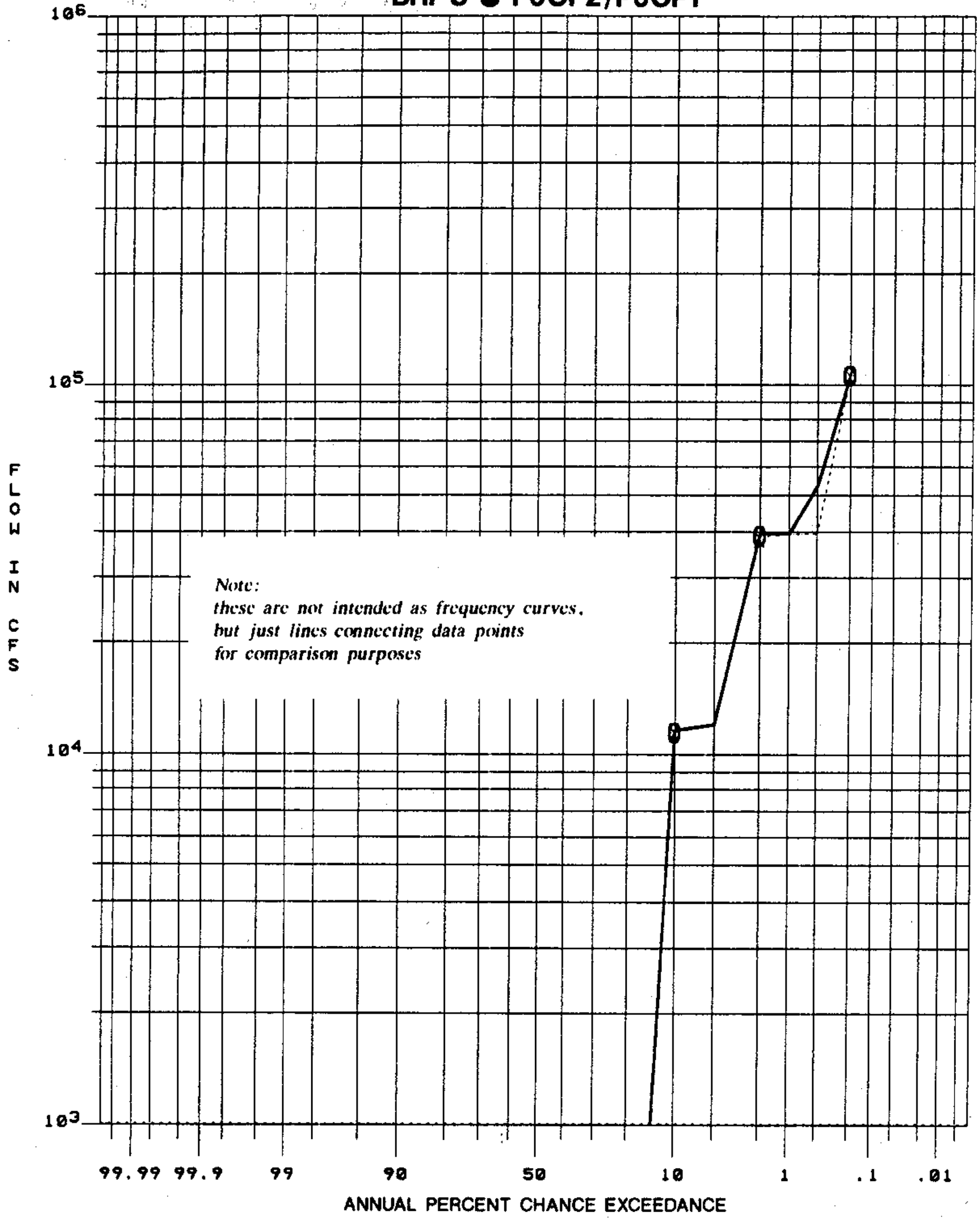


FIGURE 30-2

COMPARISON OF PEAK DISCHARGE FREQUENCY INFORMATION
SALT RIVER AT MODIFIED ROOSEVELT DAM
BHF'S ● P6OP2/P6OP1



BHF OUTFLOW

ROOSEVELT BALHYD P6OP2
ROOSEVELT BALHYD P6OP1

FIGURE 30-3

08FEB95 09:08:10

COMPARISON OF PEAK DISCHARGE FREQUENCY INFORMATION
SALT RIVER AT MODIFIED ROOSEVELT DAM
POR ● P6OP2/P925K

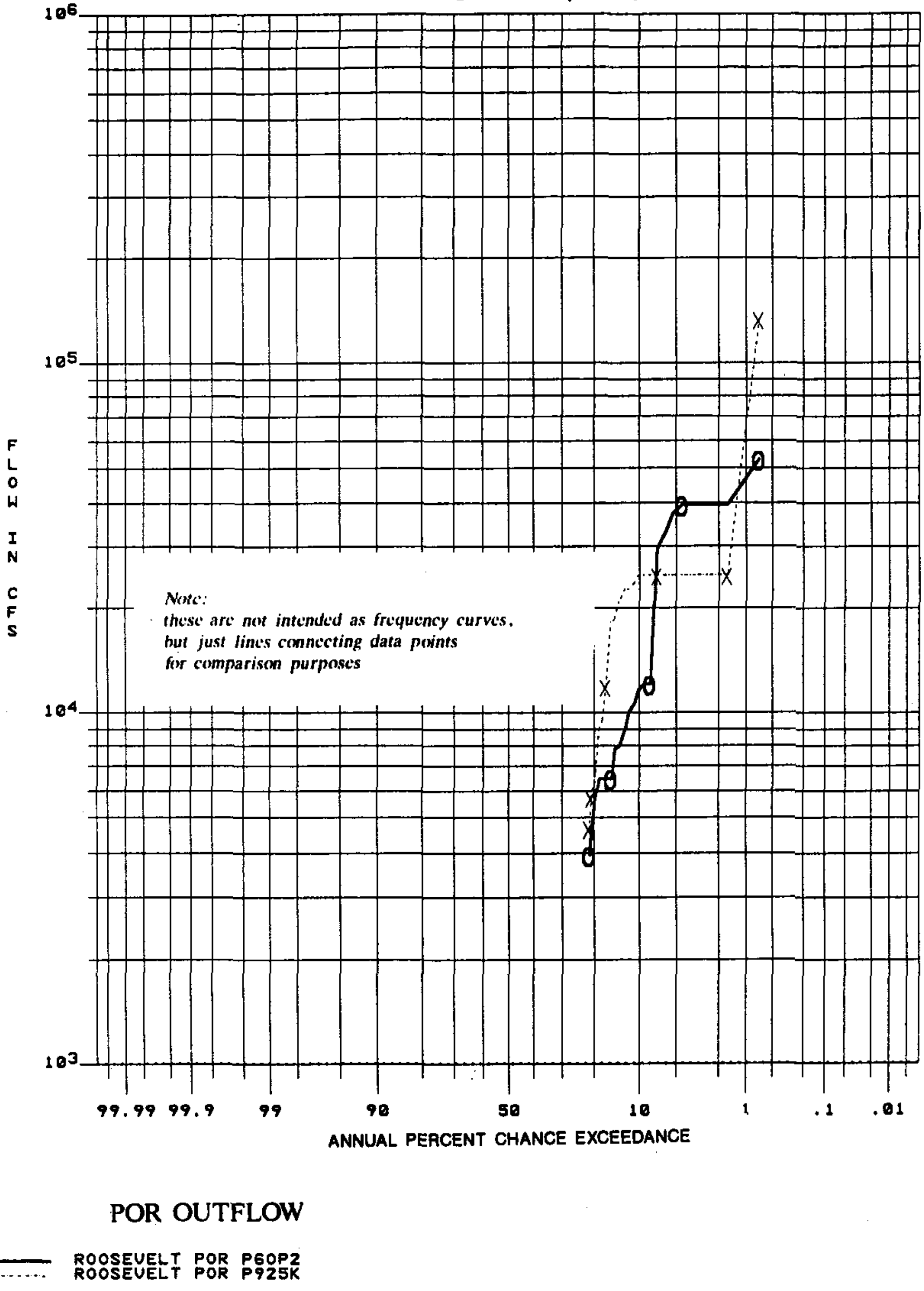


FIGURE 31-1

08FEB95 09:10:49

COMPARISON OF PEAK DISCHARGE FREQUENCY INFORMATION
SALT RIVER AT MODIFIED ROOSEVELT DAM
POR ● P6OP2/P9OP1

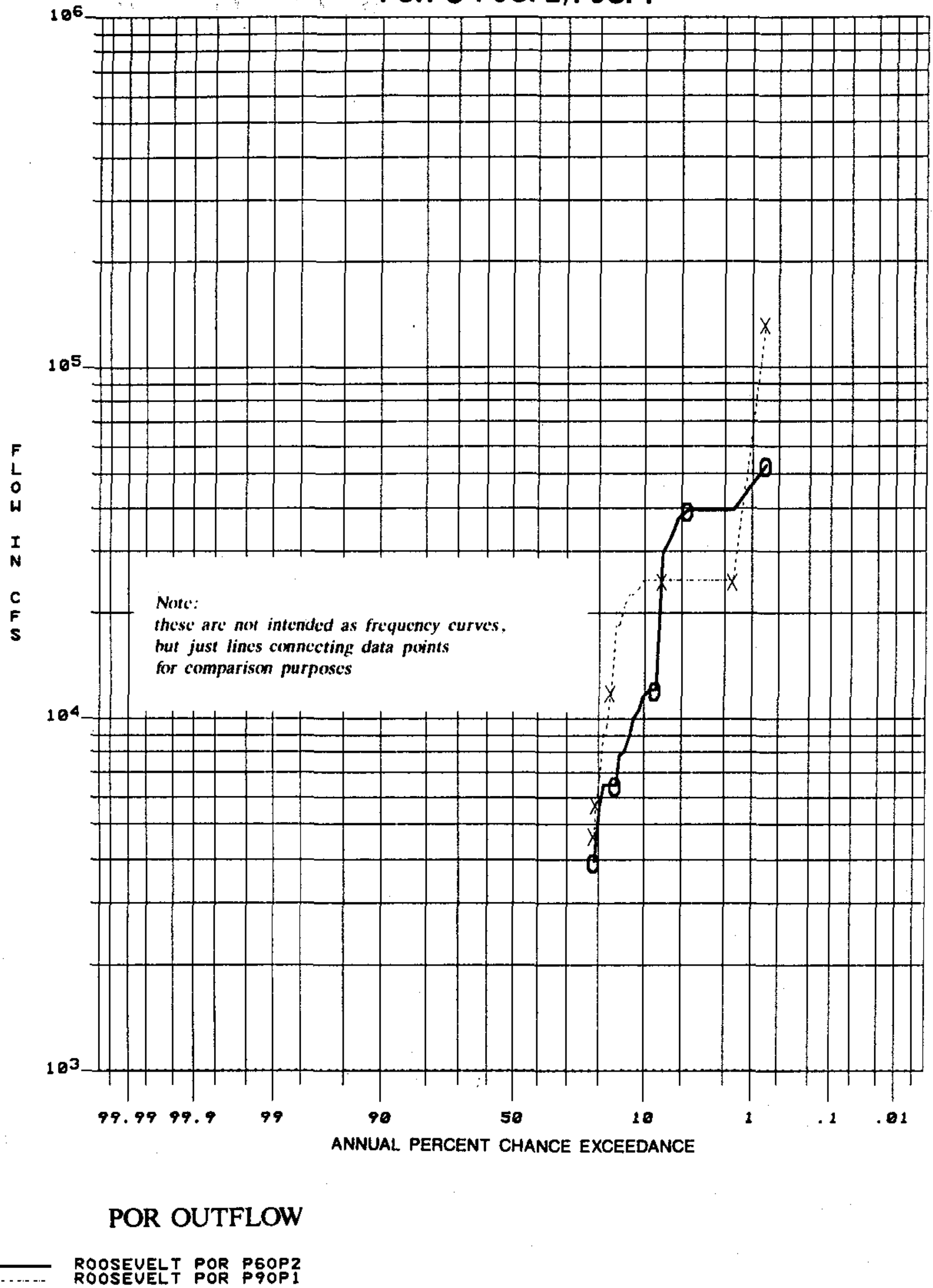


FIGURE 31-2

COMPARISON OF PEAK DISCHARGE FREQUENCY INFORMATION
SALT RIVER AT MODIFIED ROOSEVELT DAM
POR ● P6OP2/P6OP1

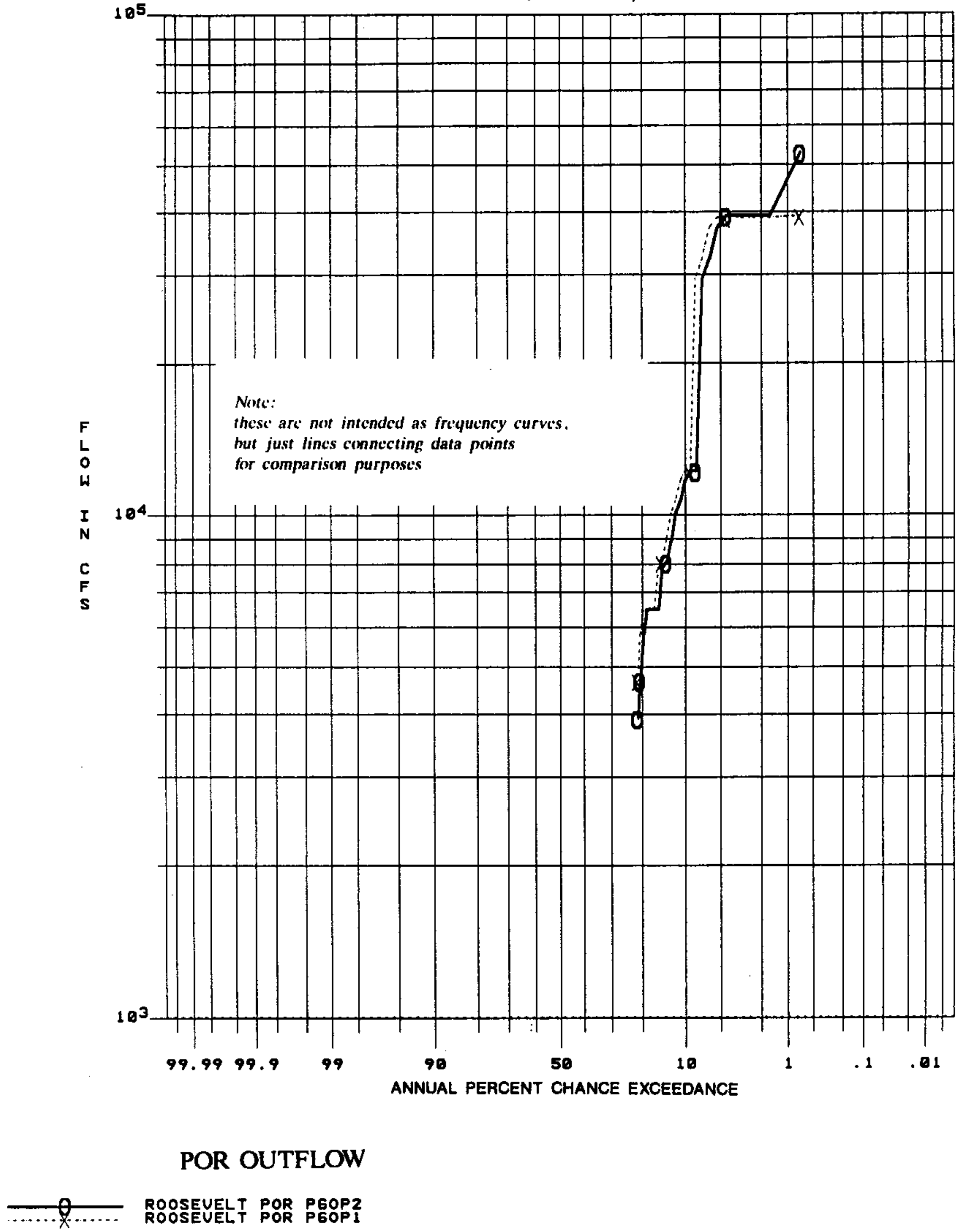


FIGURE 31-3

COMPARISON OF PEAK DISCHARGE FREQUENCY INFORMATION
SALT RIVER BL STEWART MTN DAM
POR ● P6OP2/P925K

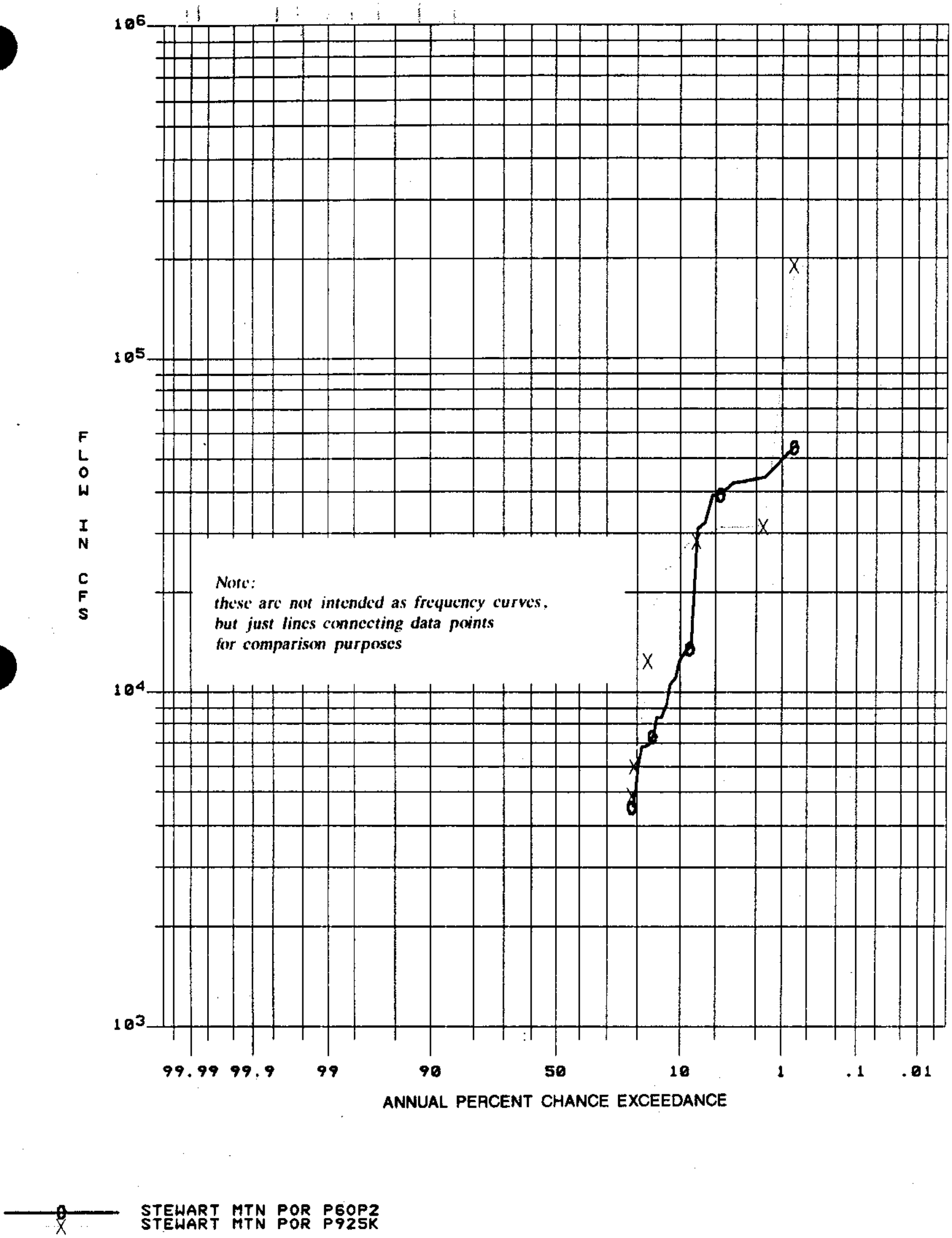


FIGURE 32-1

08FEB95 10:17:37

COMPARISON OF PEAK DISCHARGE FREQUENCY INFORMATION
SALT RIVER BL STEWART MTN DAM
POR ● P6OP2/P9OP1

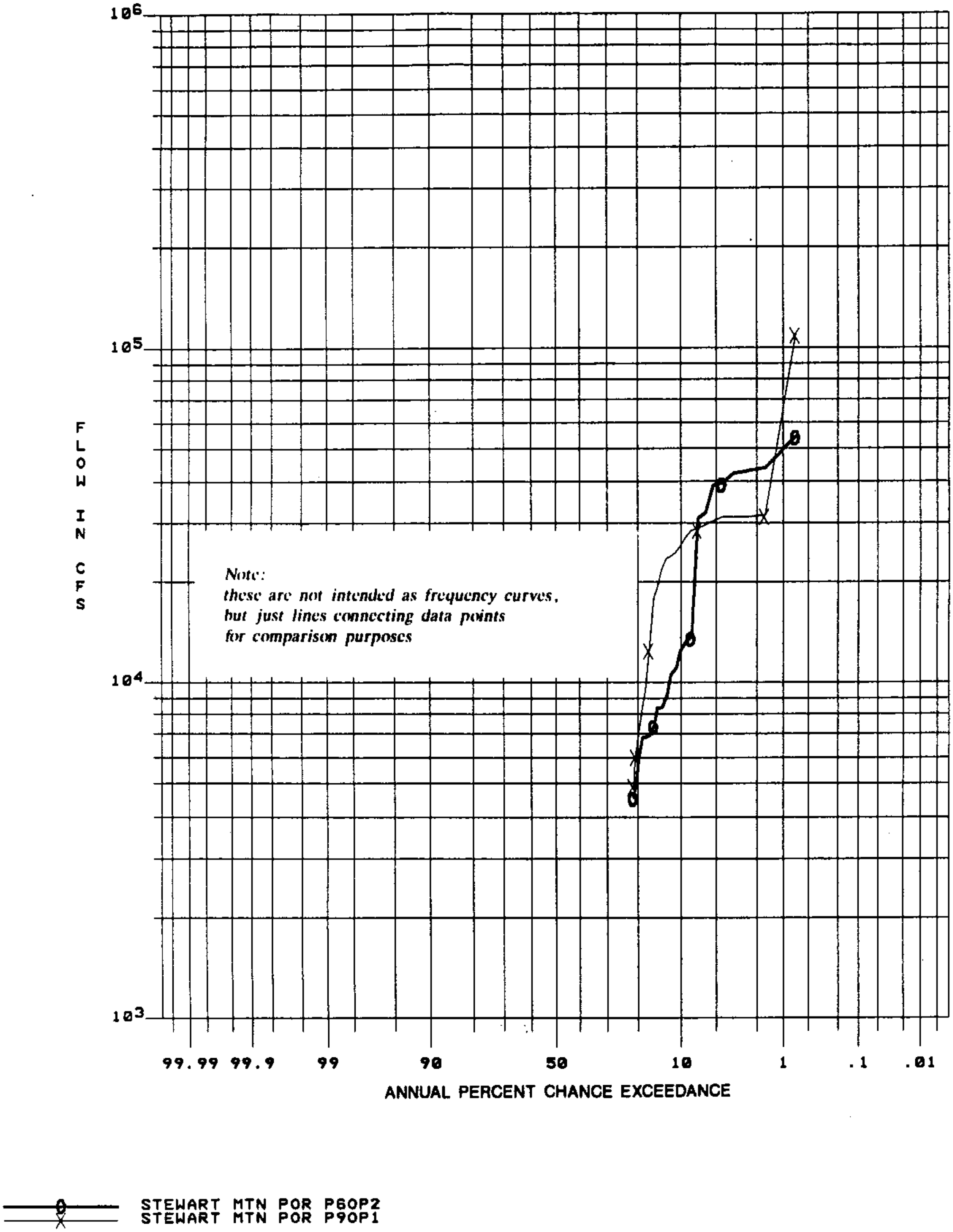


FIGURE 32-2

08FEB95 09:50:50

COMPARISON OF PEAK DISCHARGE FREQUENCY INFORMATION
SALT RIVER BL STEWART MTN DAM
POR ● P6OP2/P6OP1

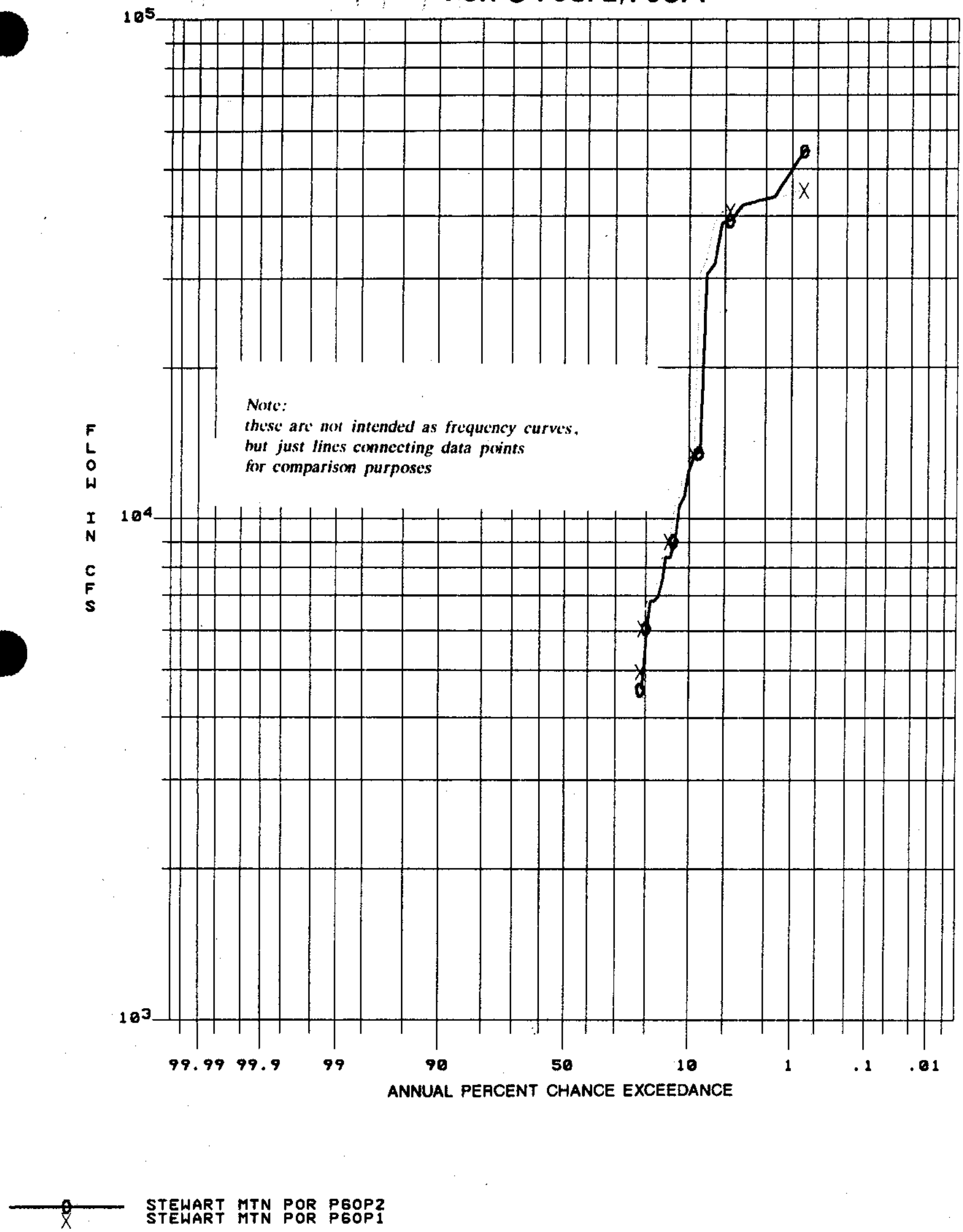


FIGURE 32-3

08FEB95 09:27:50

COMPARISON OF PEAK DISCHARGE FREQUENCY INFORMATION
SALT RIVER BL GRANITE REEF DIVERSION DAM
POR ● P6OP2/P925K

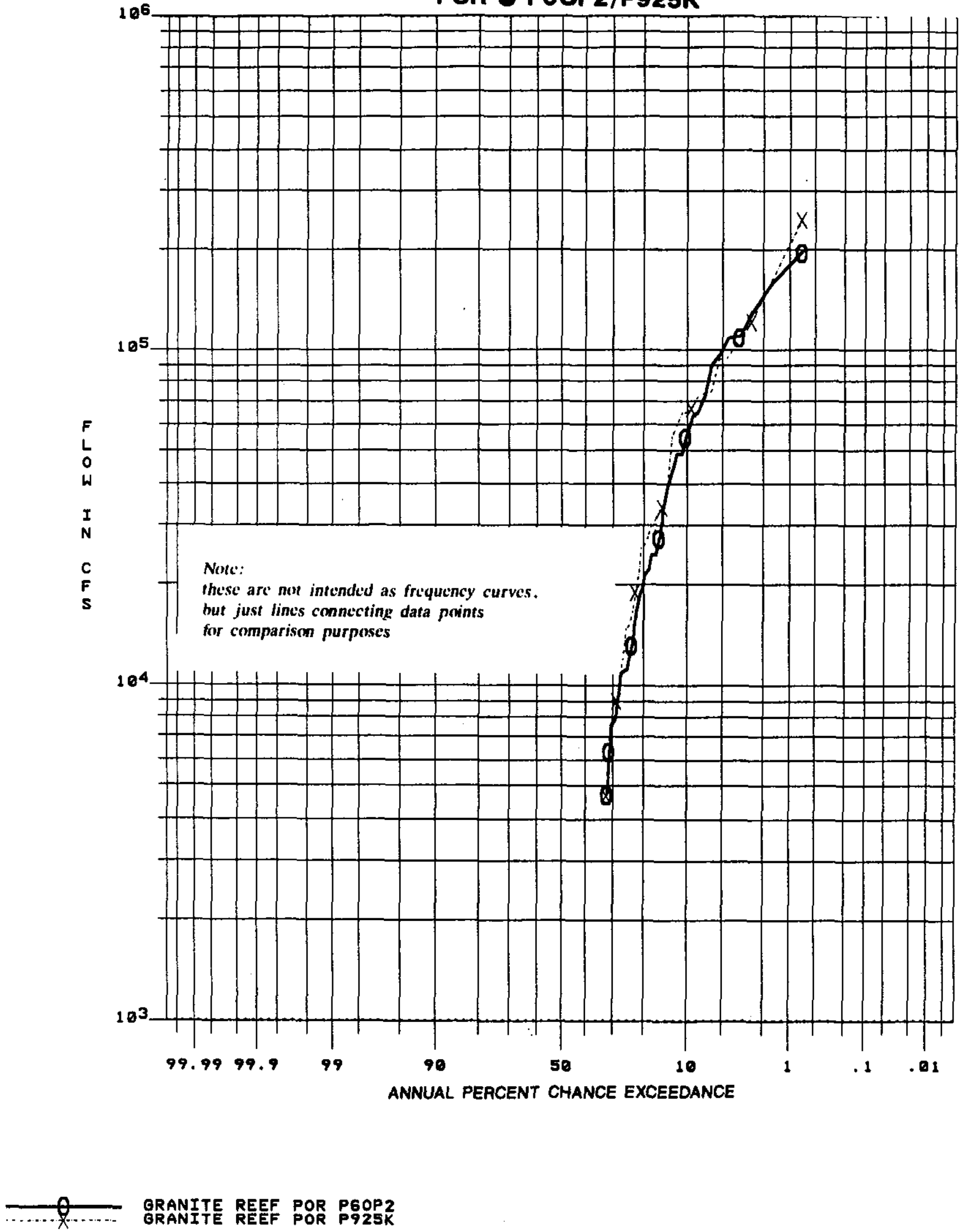


FIGURE 33-1

08FEB95 09:30:07

COMPARISON OF PEAK DISCHARGE FREQUENCY INFORMATION
SALT RIVER BL GRANITE REEF DIVERSION DAM
POR ● P6OP2/P9OP1

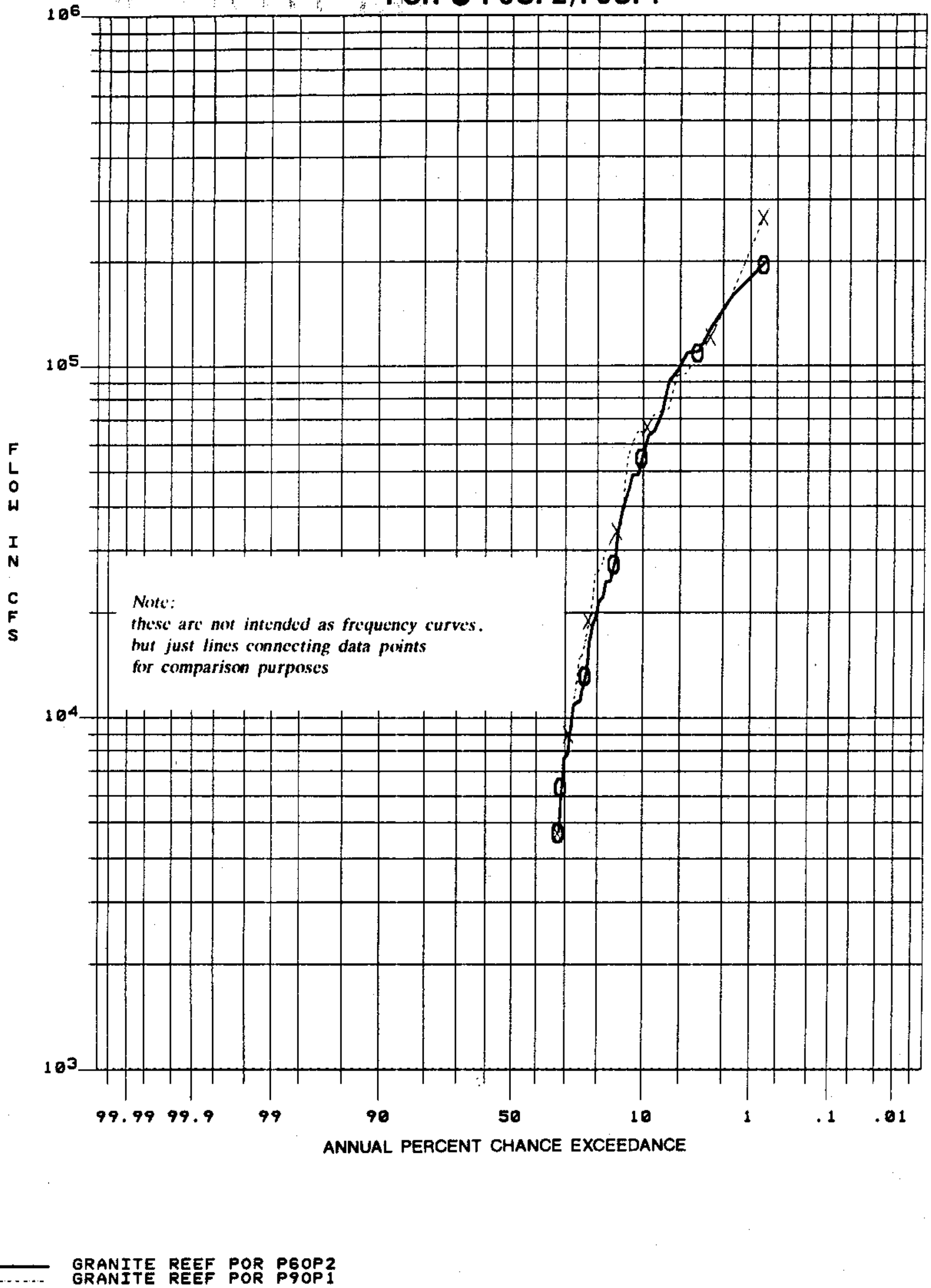


FIGURE 33-2

08FEB95 09:23:54

COMPARISON OF PEAK DISCHARGE FREQUENCY INFORMATION
SALT RIVER BL GRANITE REEF DIVERSION DAM
POR ● P6OP2/P6OP1

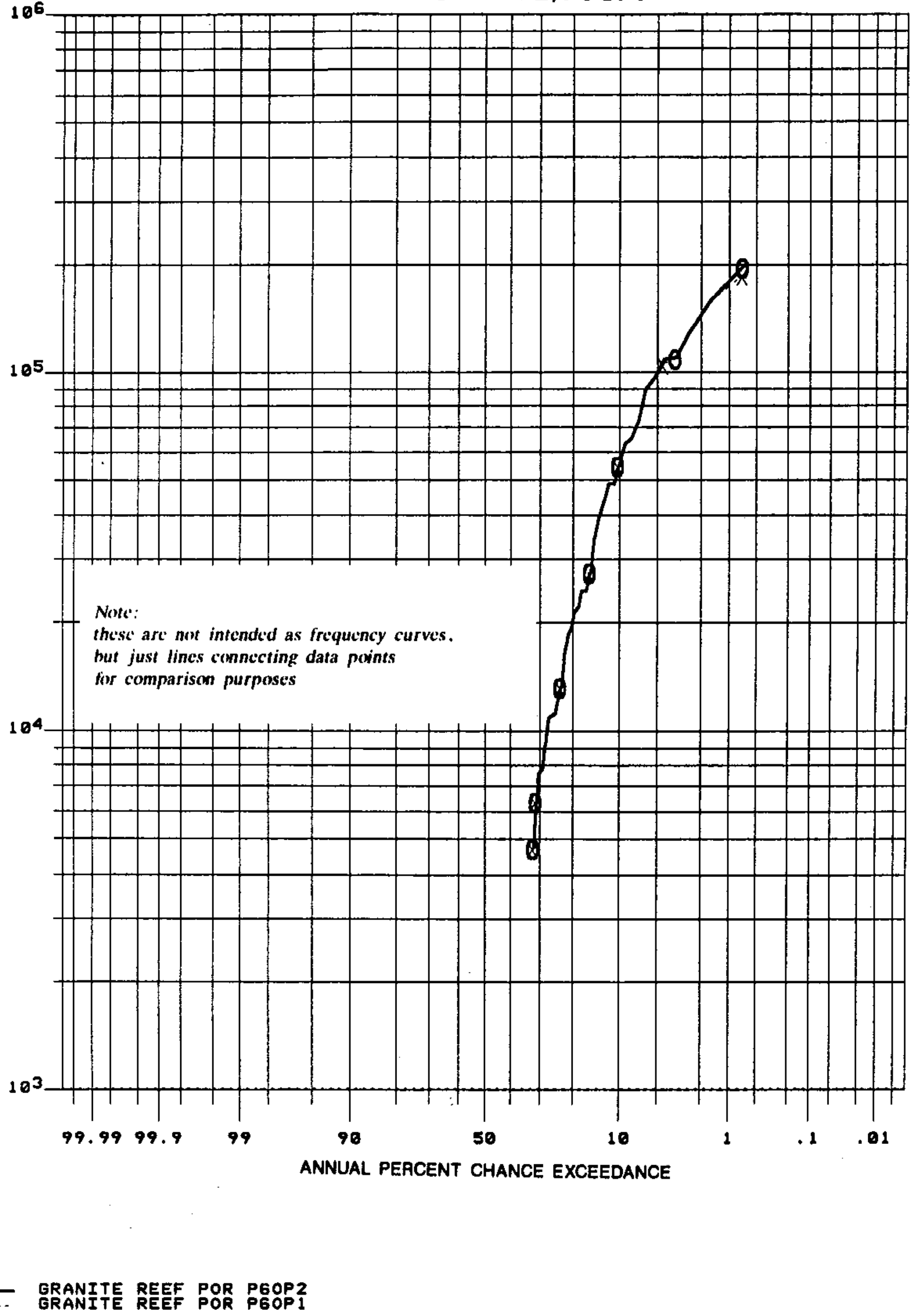


FIGURE 33-3

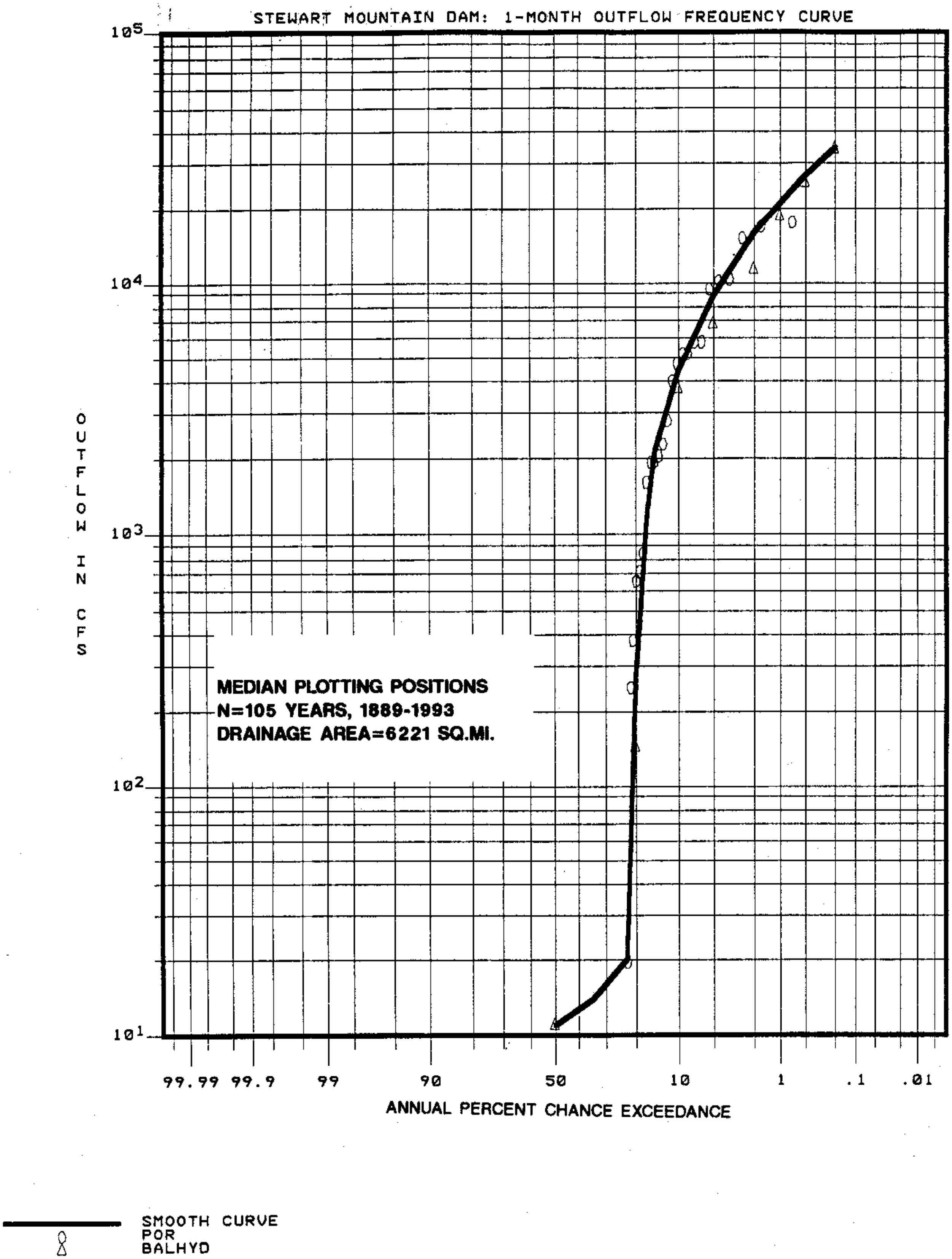

STEWART MOUNTAIN DAM: 1-MONTH OUTFLOW FREQUENCY CURVE
10^5
10^4
10^3
10^2
10^1
OUTFLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=6221 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
SMOOTH CURVE
POR
BALHYD

FIGURE 34-1

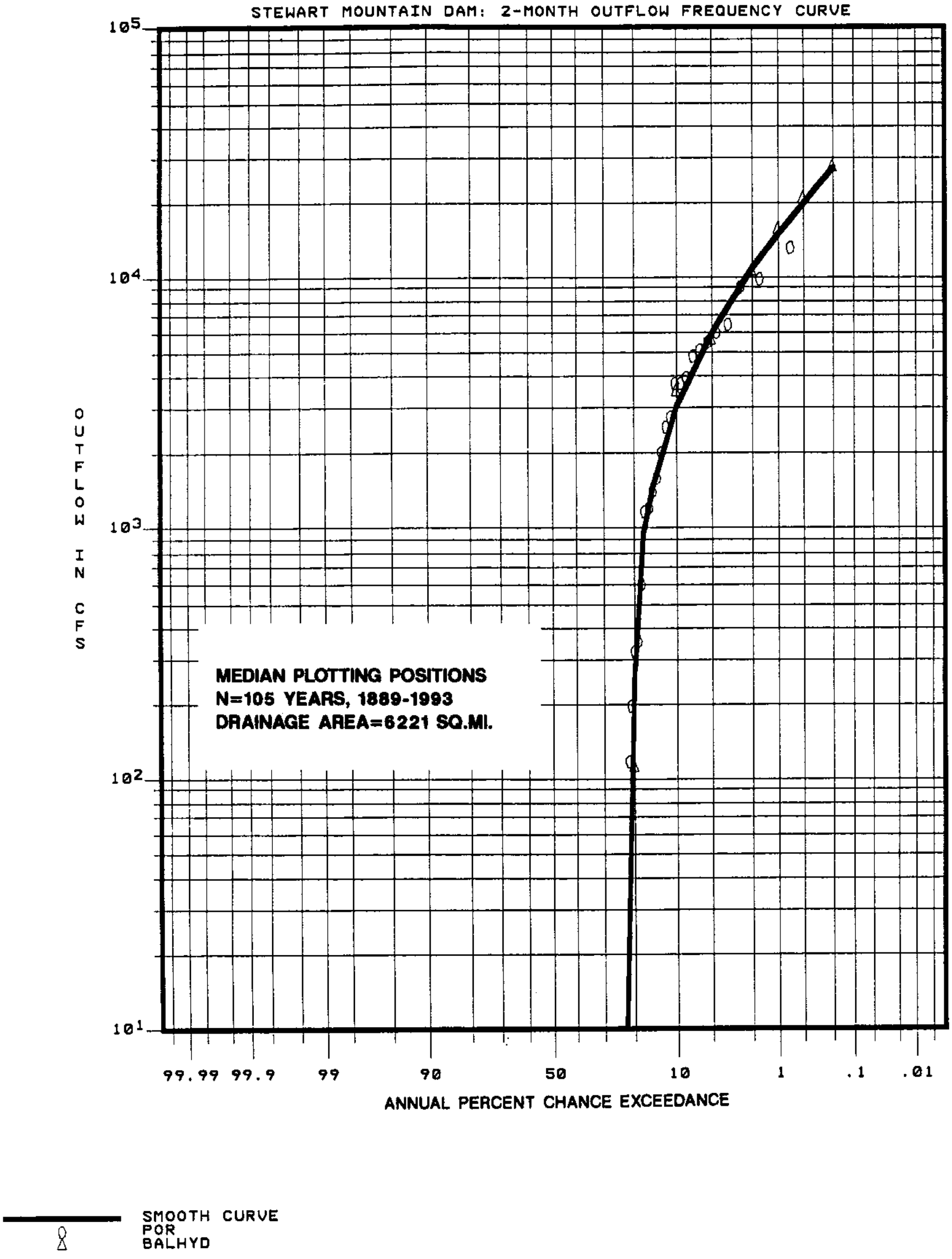

STEWART MOUNTAIN DAM: 2-MONTH OUTFLOW FREQUENCY CURVE
10^5
10^4
10^3
10^2
10^1
OUTFLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=6221 SQ.MI.
99.99
99.9
99
90
50
10
1
.1
.01
ANNUAL PERCENT CHANCE EXCEEDANCE
SMOOTH CURVE
POR
BALHYD

FIGURE 34-2

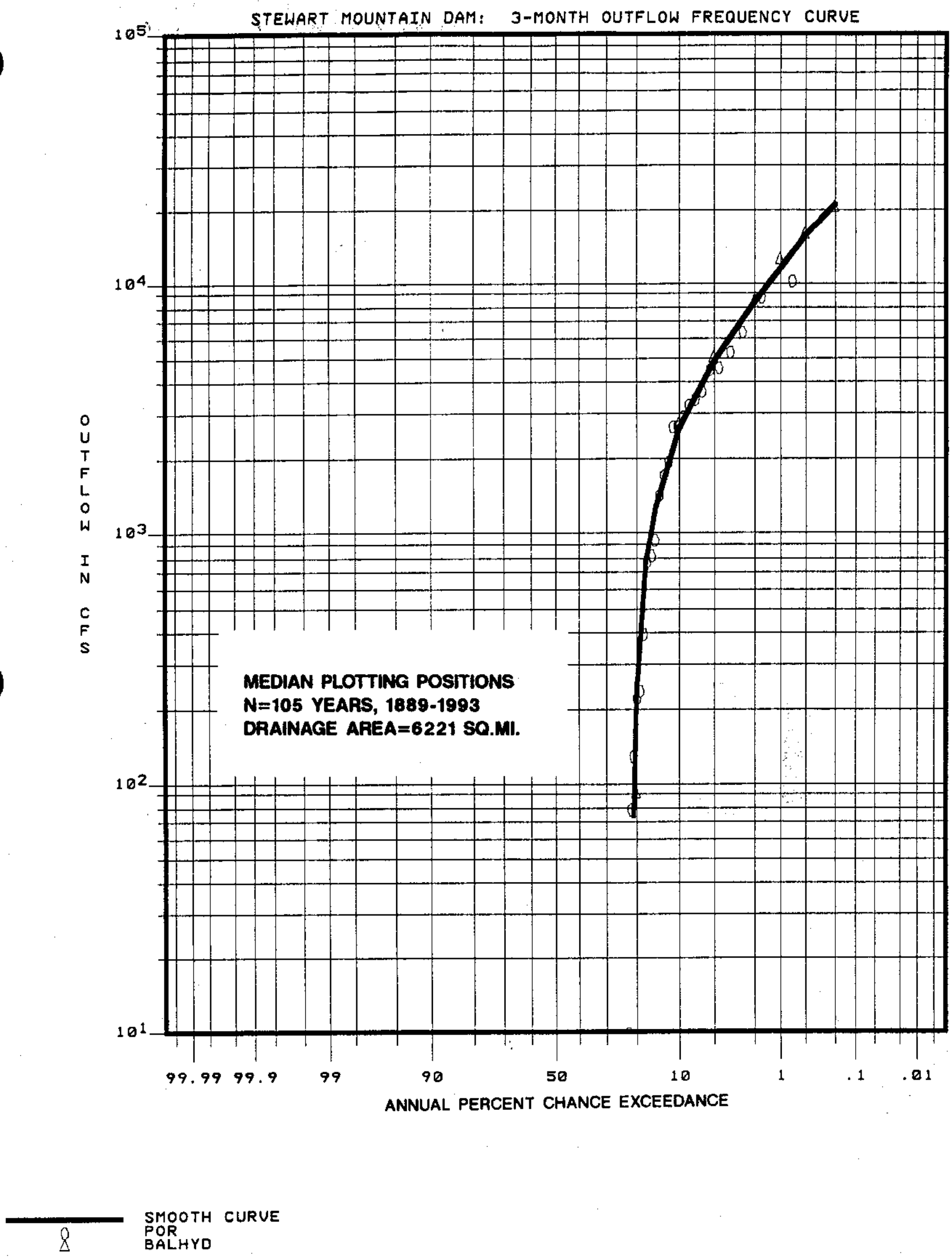

STEWART MOUNTAIN DAM: 3-MONTH OUTFLOW FREQUENCY CURVE
10^5
10^4
10^3
10^2
10^1
OUTFLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=6221 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
SMOOTH CURVE
POR
BALHYD

FIGURE 34-3

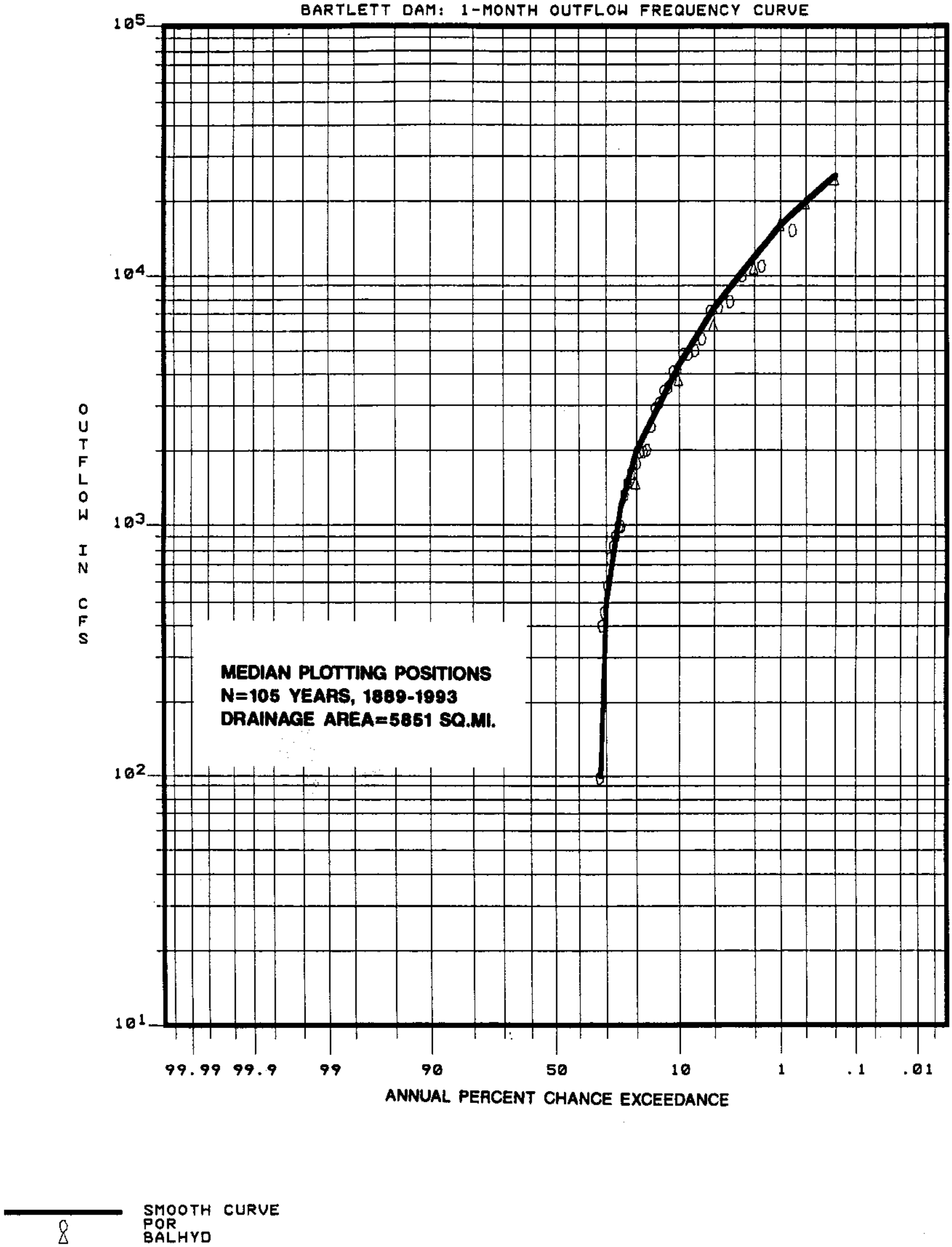

BARTLETT DAM: 1-MONTH OUTFLOW FREQUENCY CURVE
10^5
10^4
10^3
10^2
10^1
OUTFLOW IN CFS
MEDIAN PLOTTING POSITIONS
N=105 YEARS, 1889-1993
DRAINAGE AREA=5851 SQ.MI.
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE
SMOOTH CURVE
POR
BALHYD

FIGURE 35-1

15JUN95 15:52:57

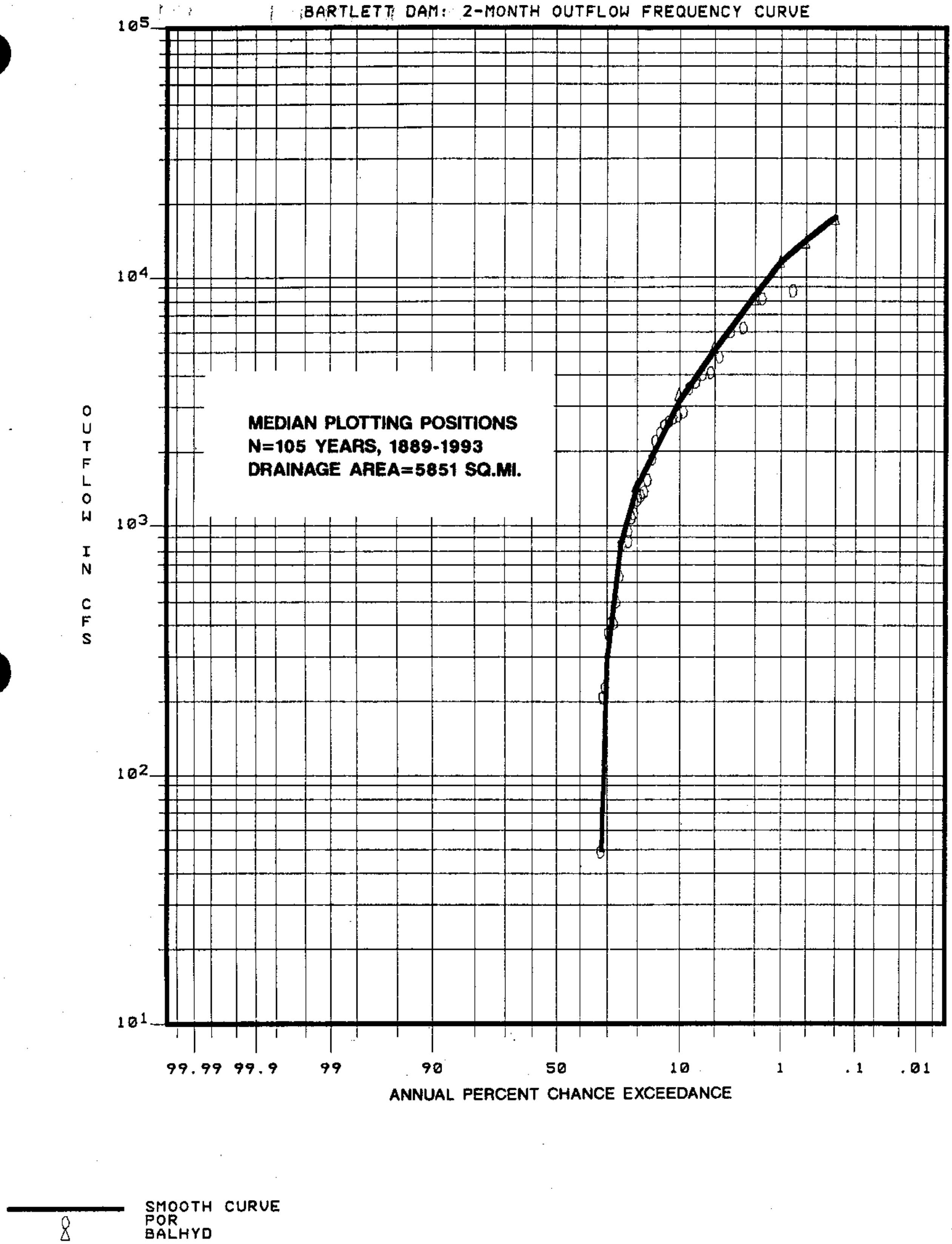


FIGURE 35-2

15JUN95 15:55:42

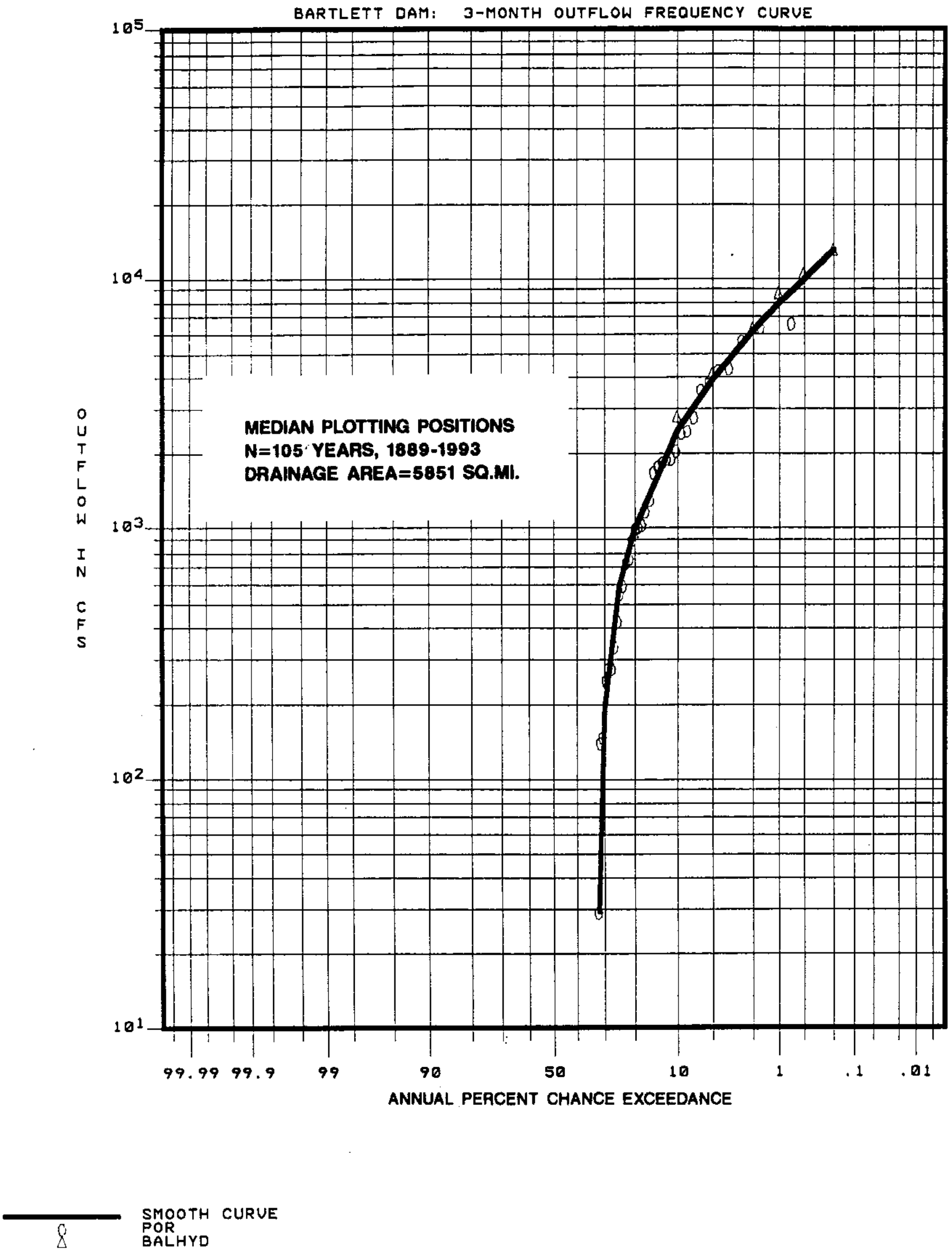


FIGURE 35-3

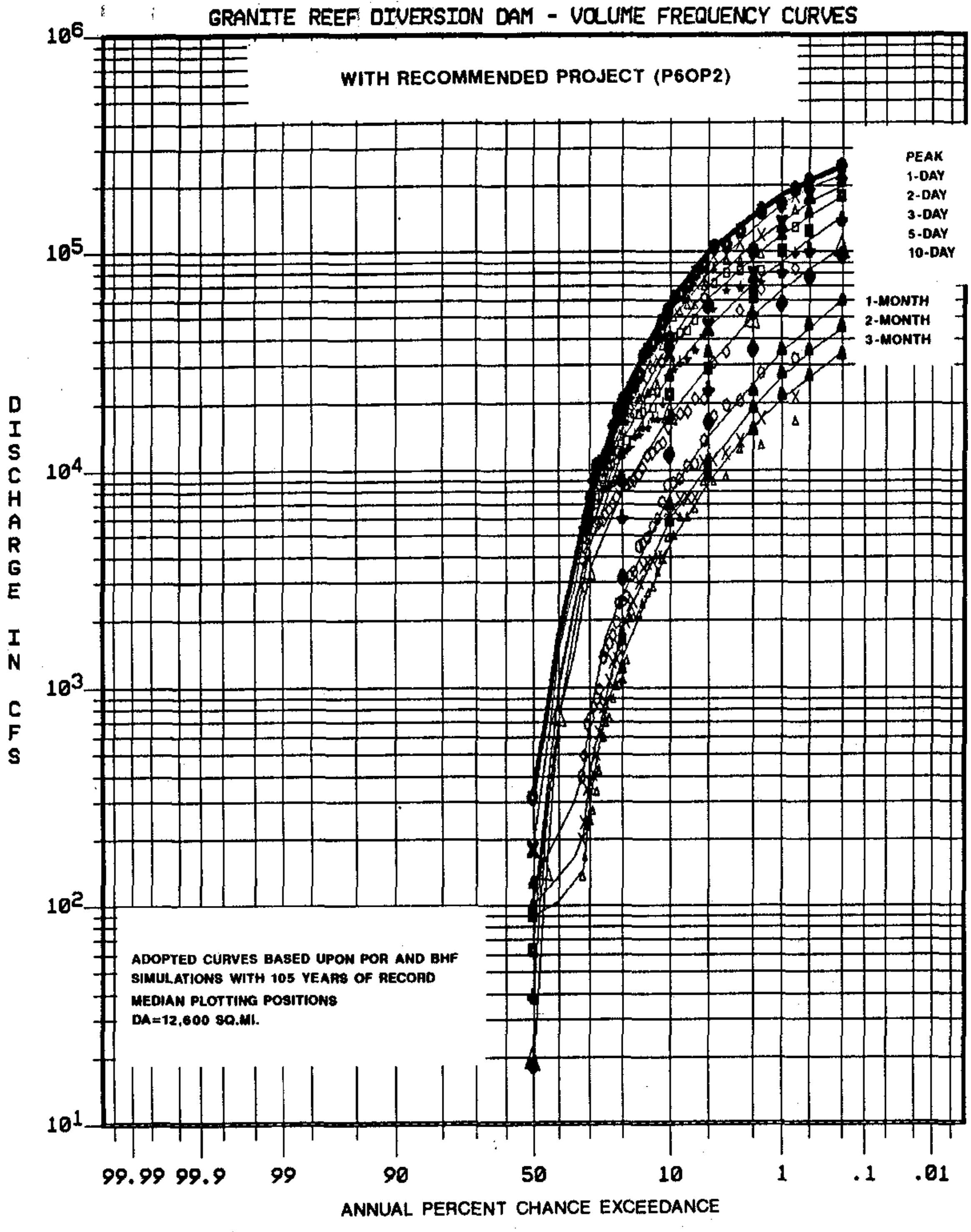
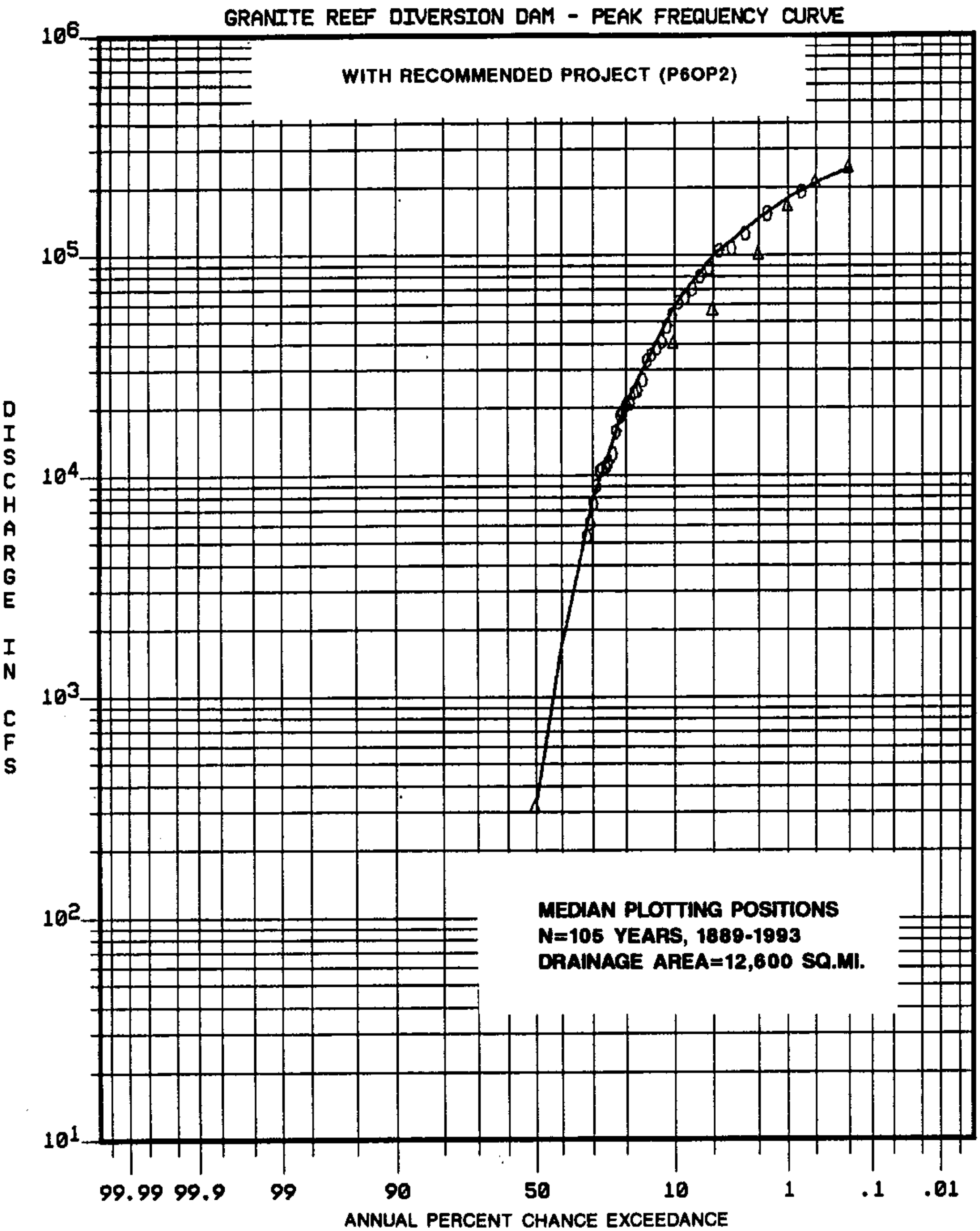

GRANITE REEF DIVERSION DAM - VOLUME FREQUENCY CURVES
WITH RECOMMENDED PROJECT (P6OP2)
PEAK
1-DAY
2-DAY
3-DAY
5-DAY
10-DAY
1-MONTH
2-MONTH
3-MONTH
ADOPTED CURVES BASED UPON POR AND BHF
SIMULATIONS WITH 105 YEARS OF RECORD
MEDIAN PLOTTING POSITIONS
DA=12,600 SQ.MI.
DISCHARGE IN CFS
10^6
10^5
10^4
10^3
10^2
10^1
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE

FIGURE 36-1

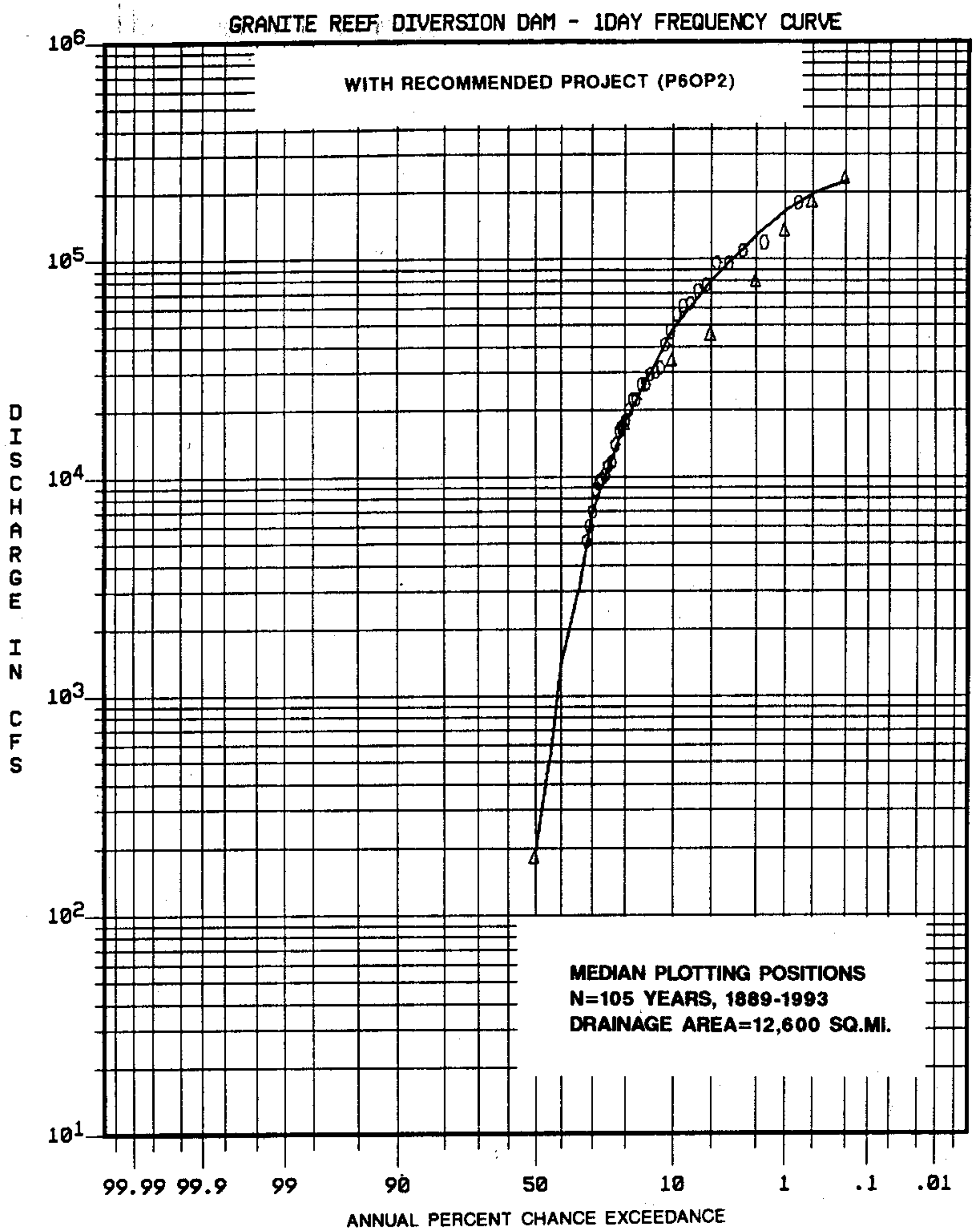
07JUN95 13:58:44



ADOPTED PEAK CURVE
○ - POR
△ - BHF

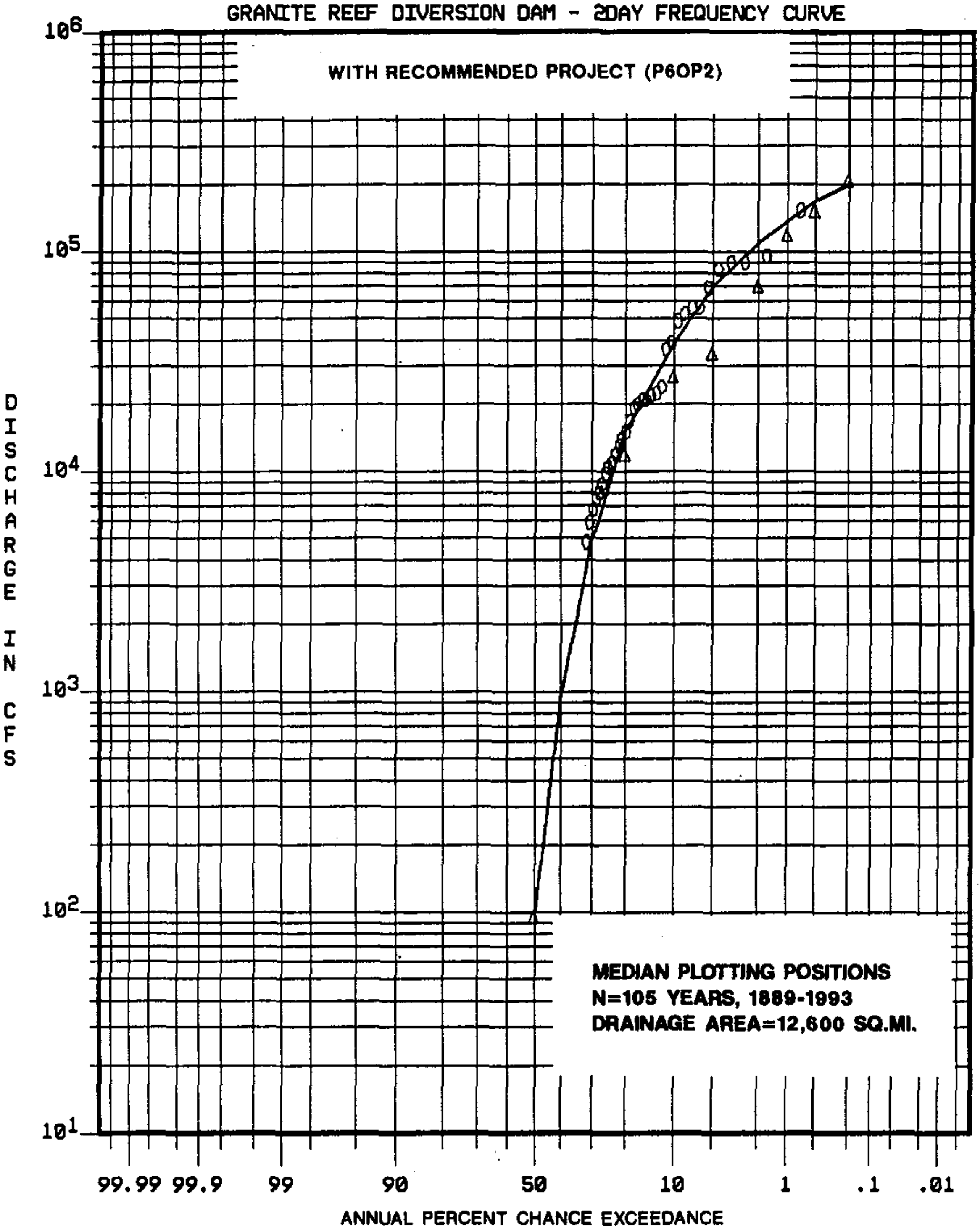
FIGURE 36-2

07JUN95 13:59:23



ADOPTED 1-DAY CURVE
○ - POR
△ - BHF

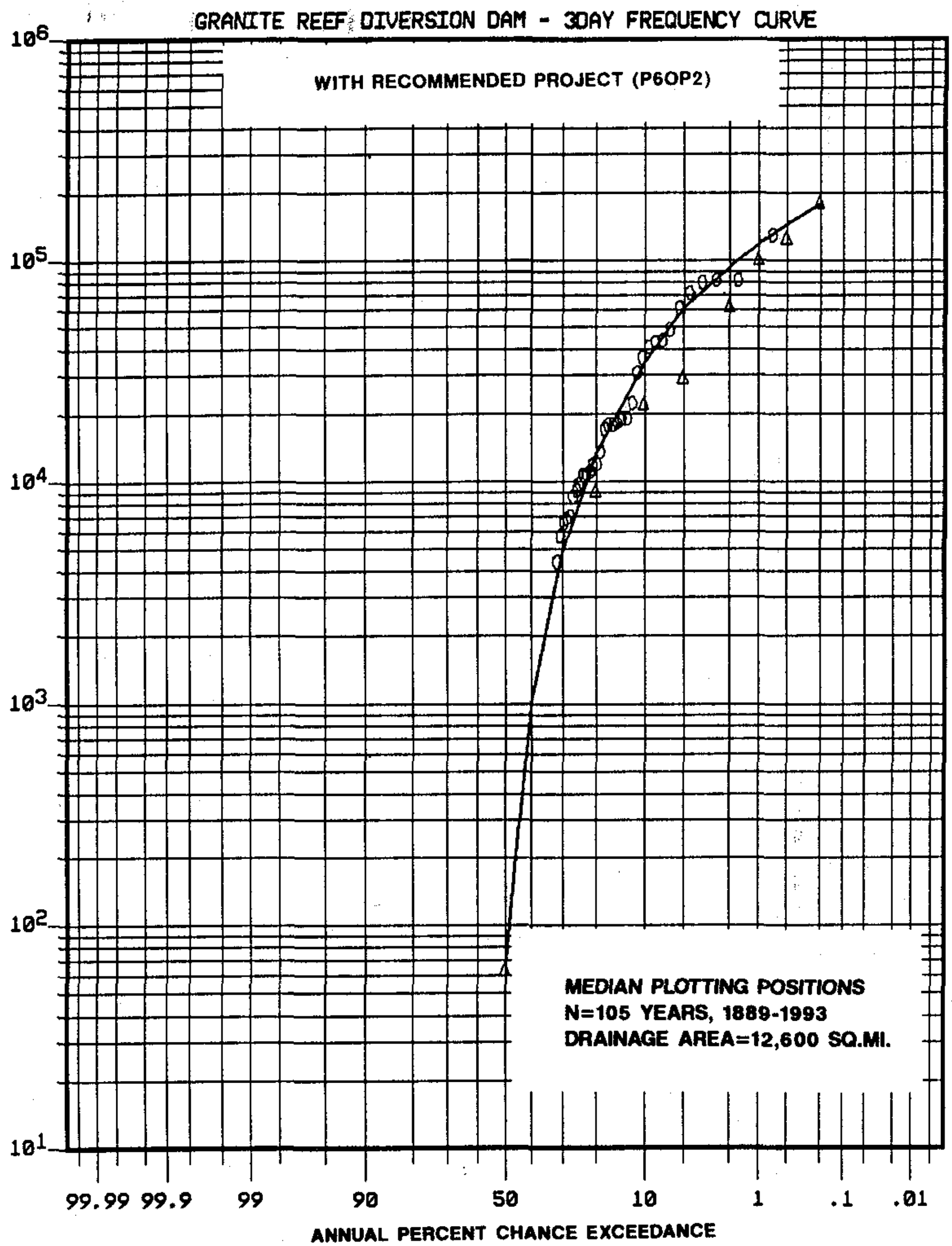
FIGURE 36-3



ADOPTED 2-DAY CURVE
○ - POR
△ - BHF

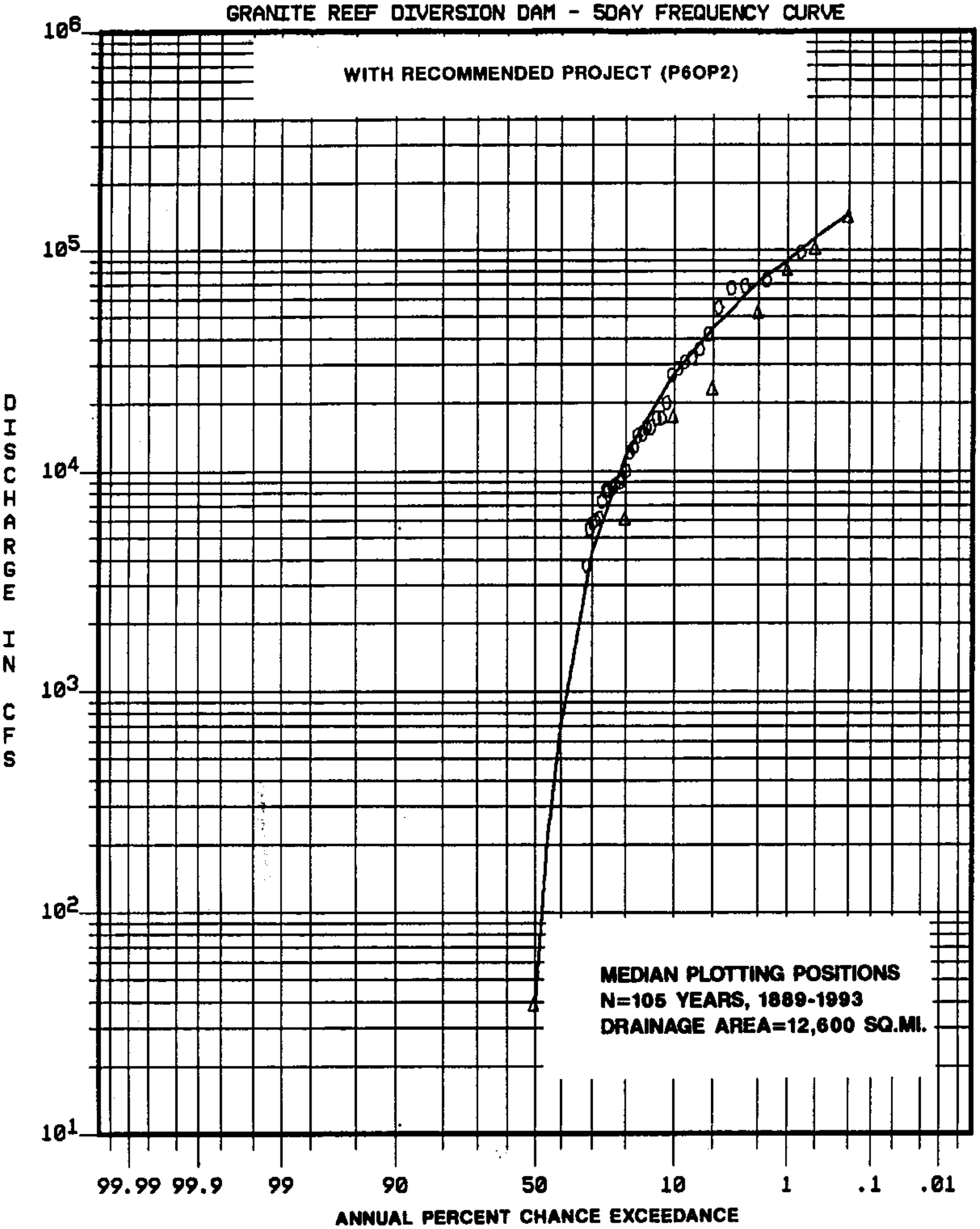
FIGURE 36-4

07JUN95 14:01:16



ADOPTED 3-DAY CURVE
○ - POR
△ - BHF

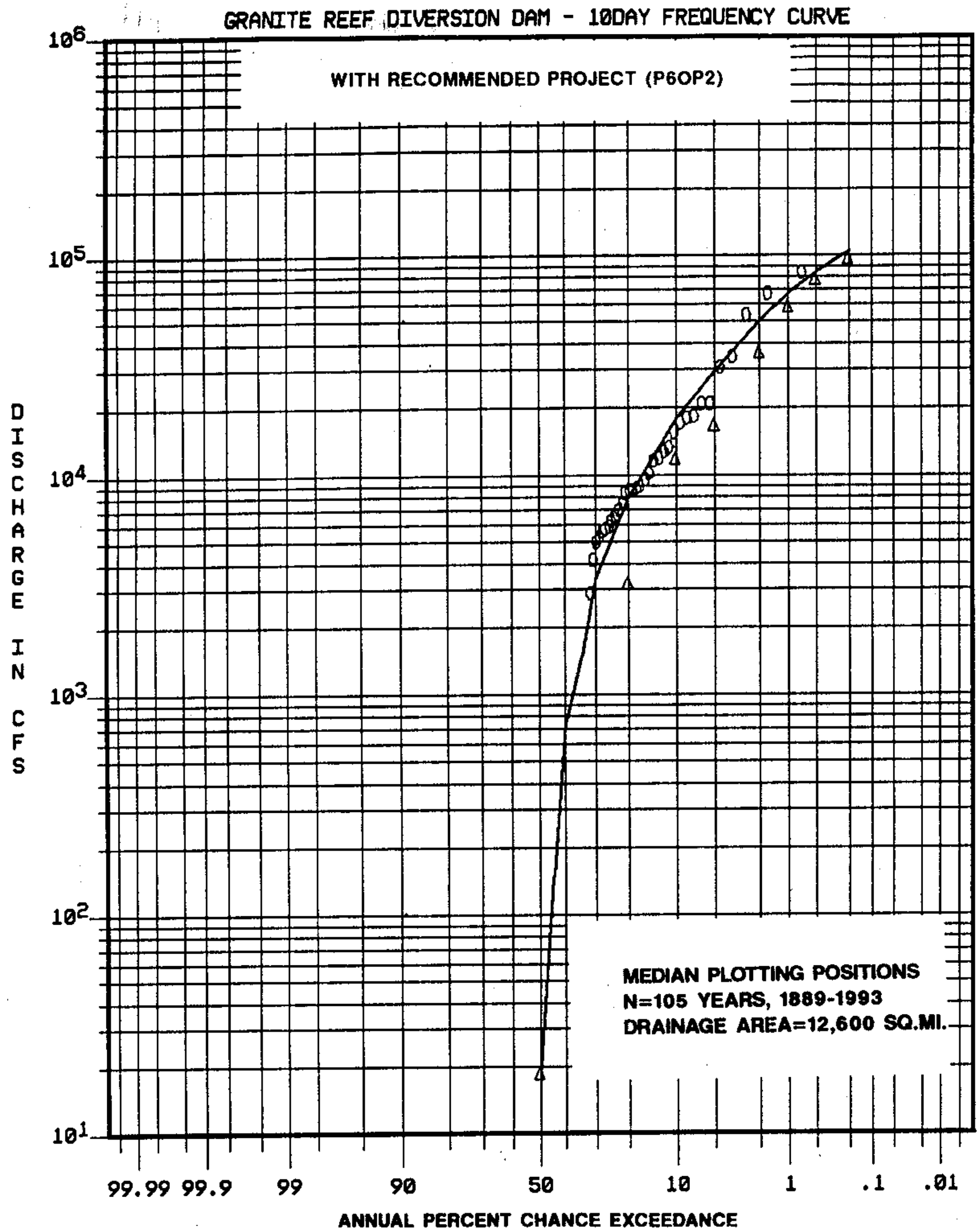
FIGURE 36-5



ADOPTED 5-DAY CURVE
○ - POR
△ - BHF

FIGURE 36-6

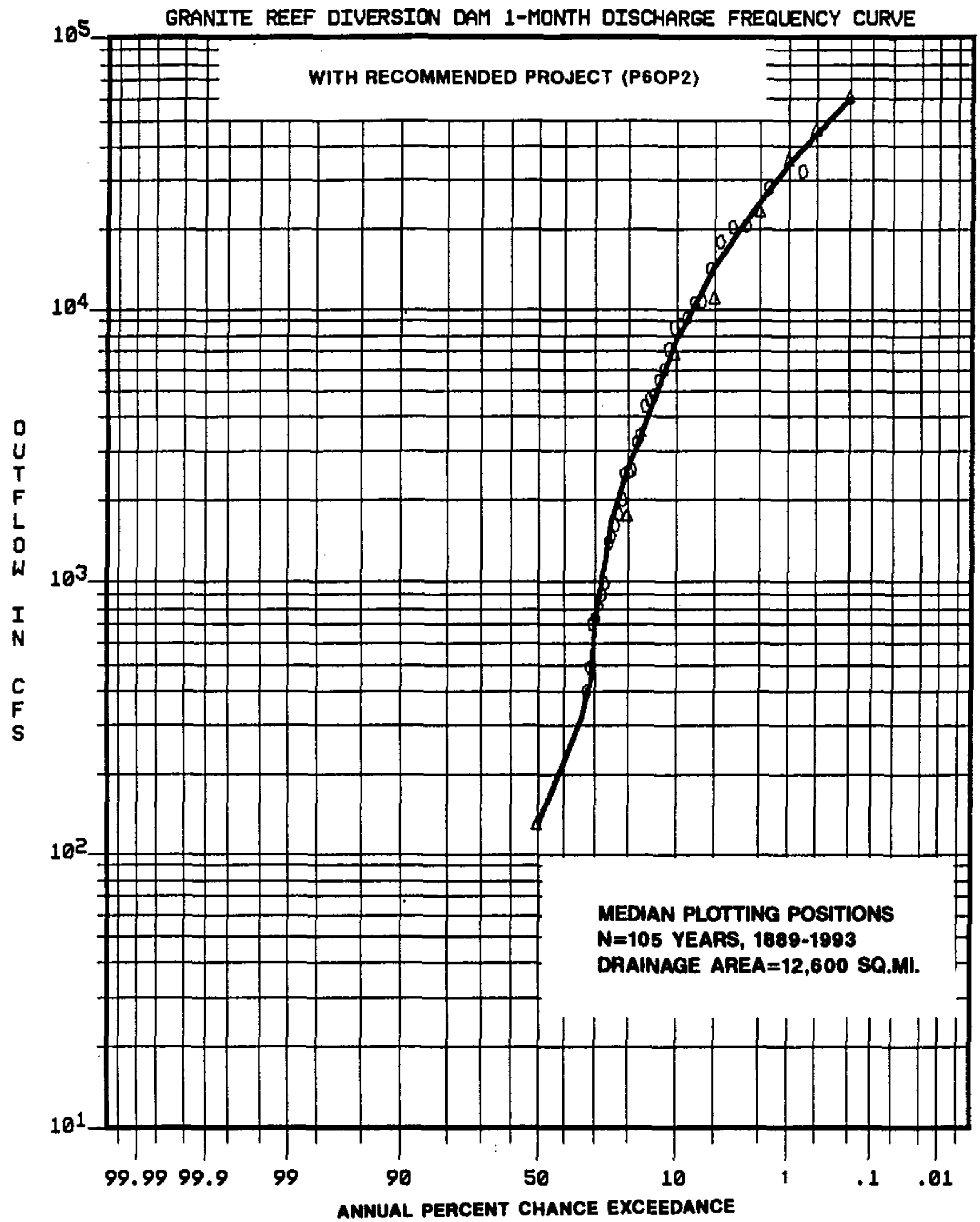
07JUN95 14:03:09



ADOPTED 10-DAY CURVE
○ - POR
△ - BHF

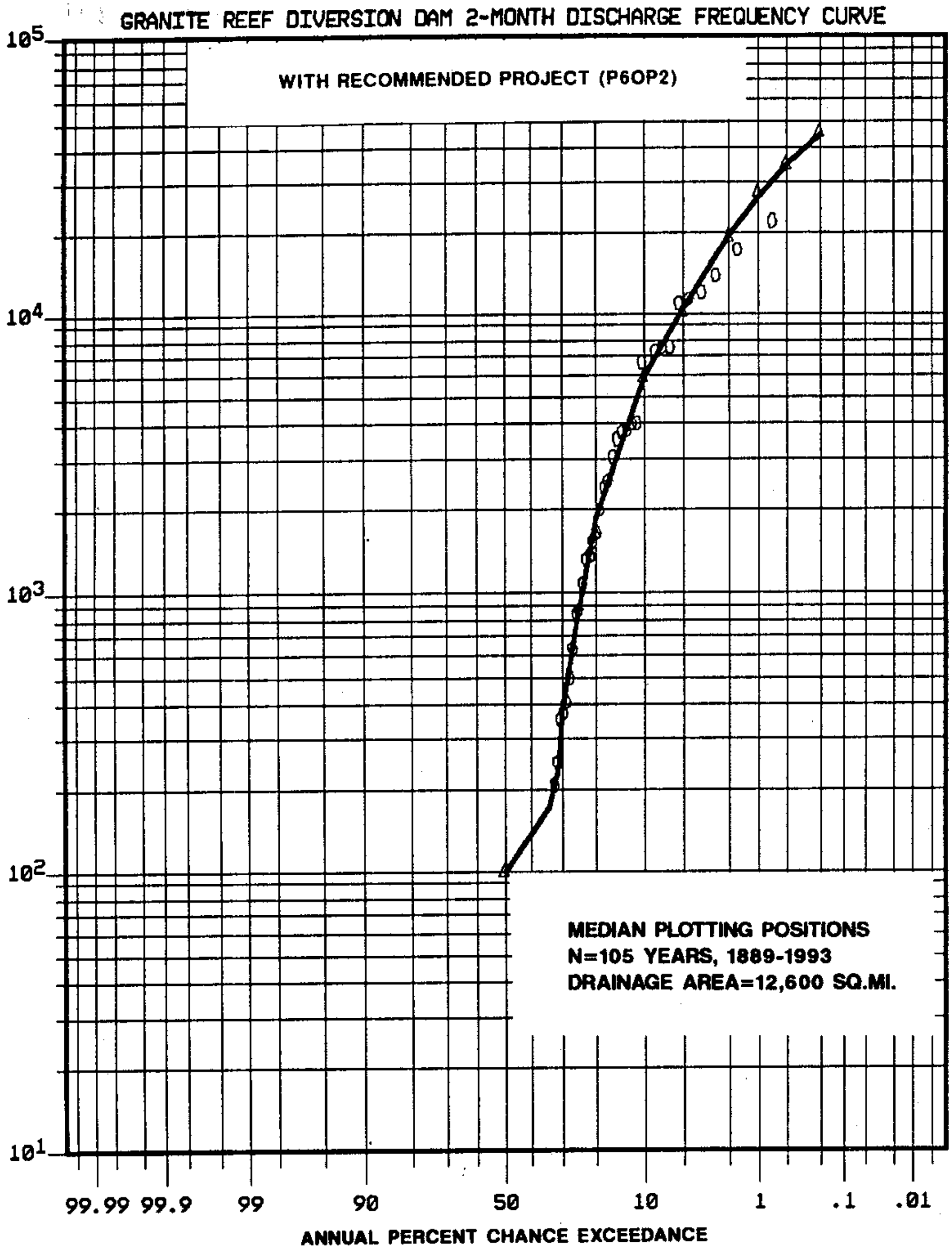
FIGURE 36-7

09JUN95 15:12:47



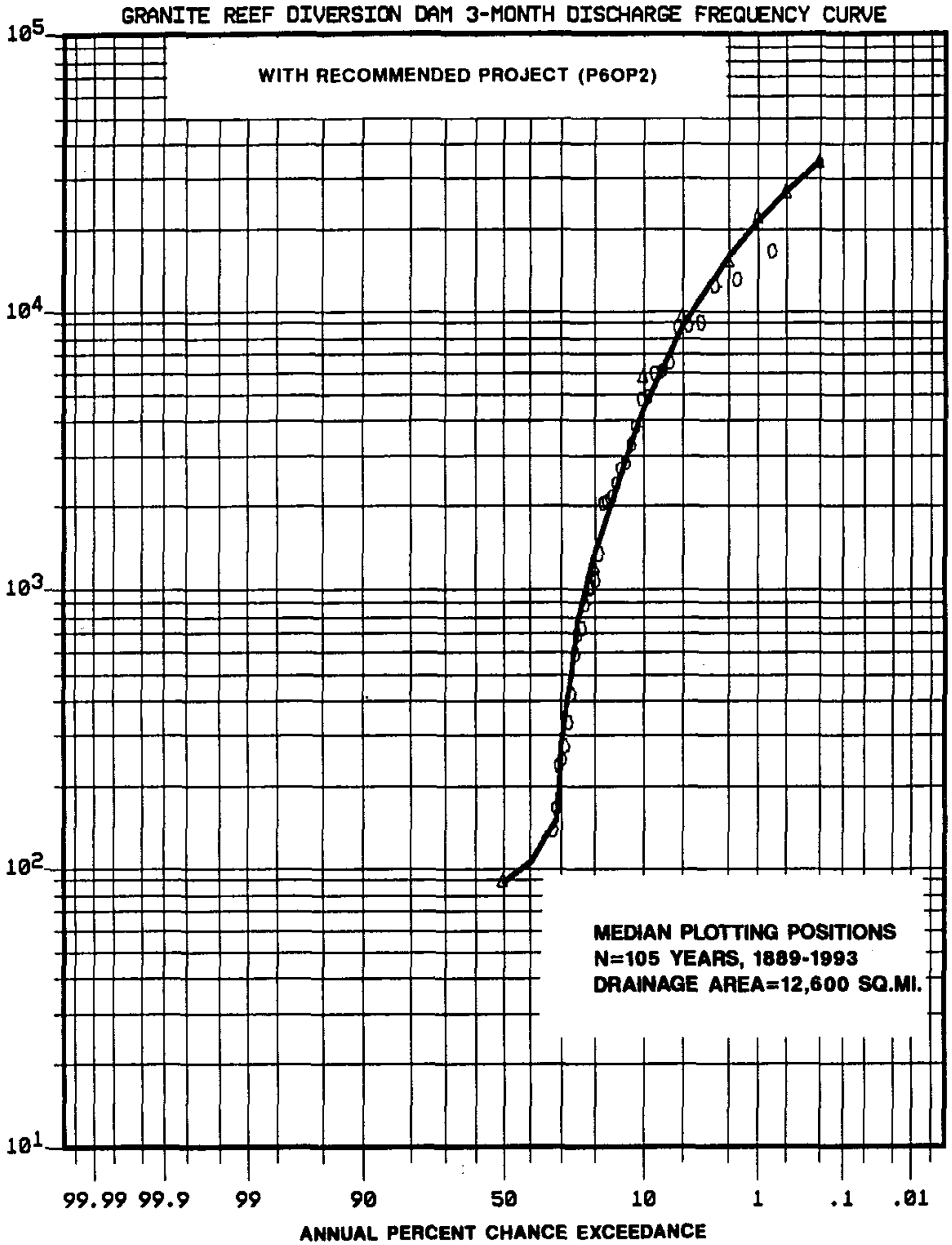
ADOPTED 1-MONTH CURVE
○ - POR
△ - BHF

FIGURE 36-8



ADOPTED 2-MONTH CURVE
○ - POR
△ - BHF

FIGURE 36-9



ADOPTED 3-MONTH CURVE
○ - POR
△ - BHF

FIGURE 36-10

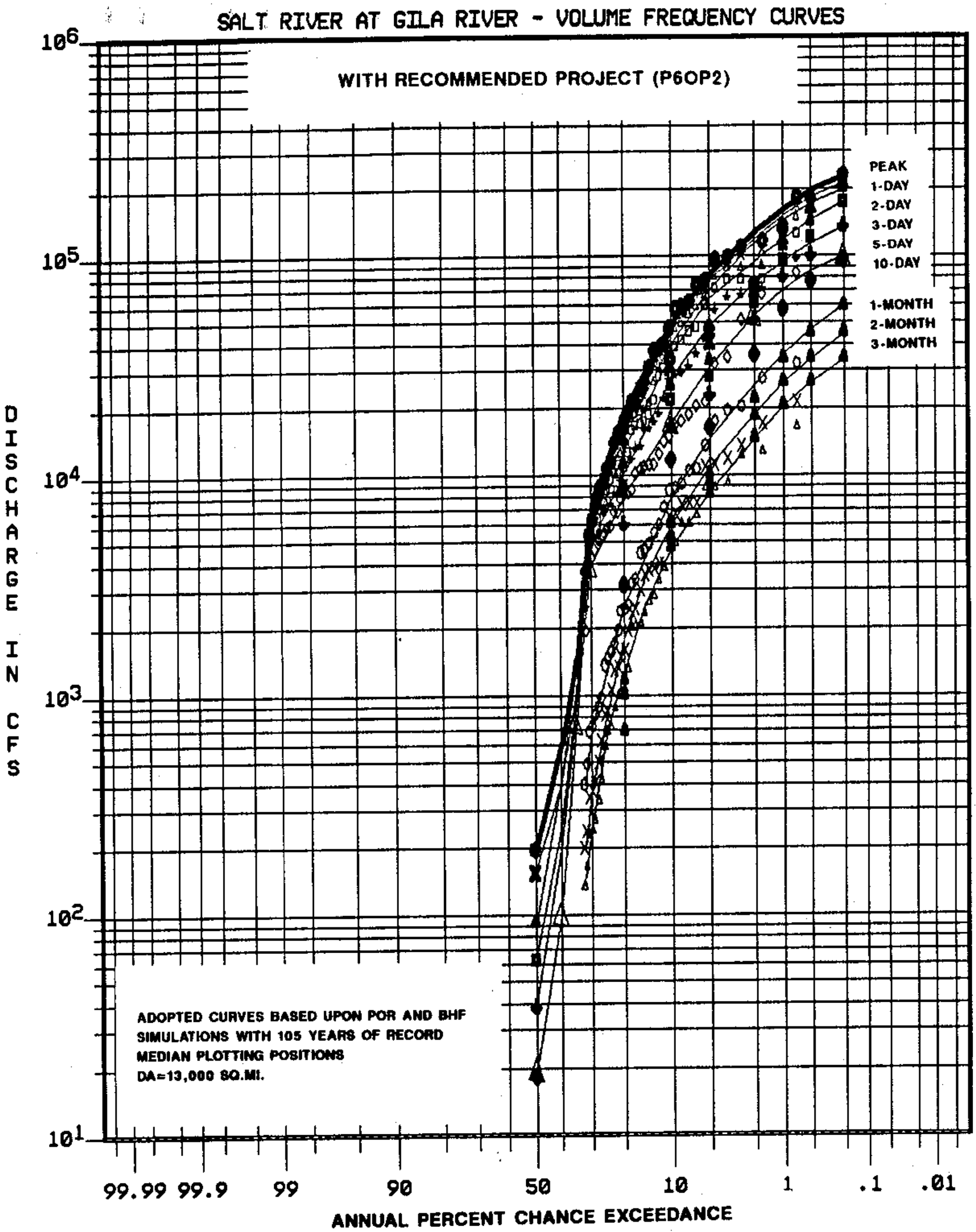
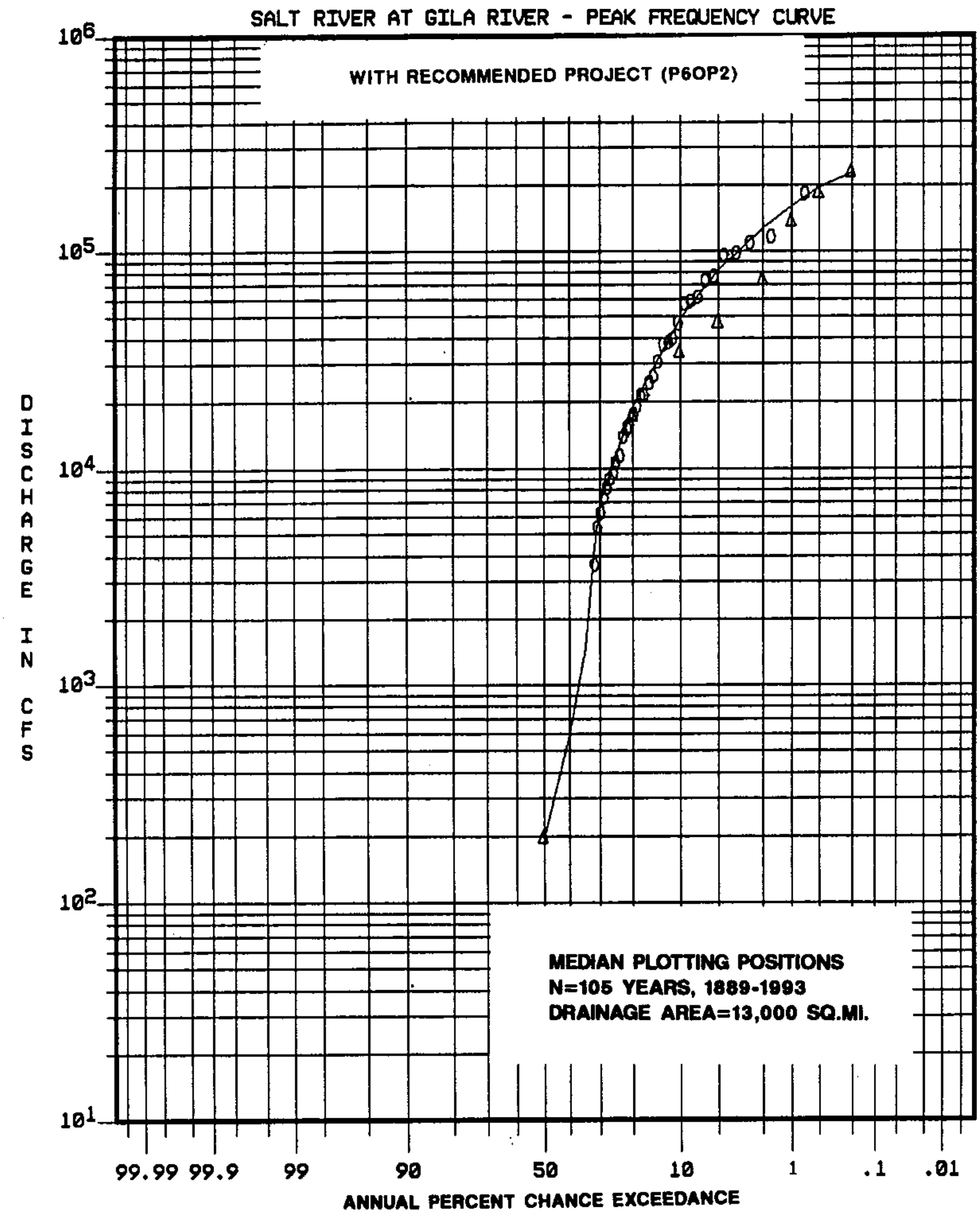
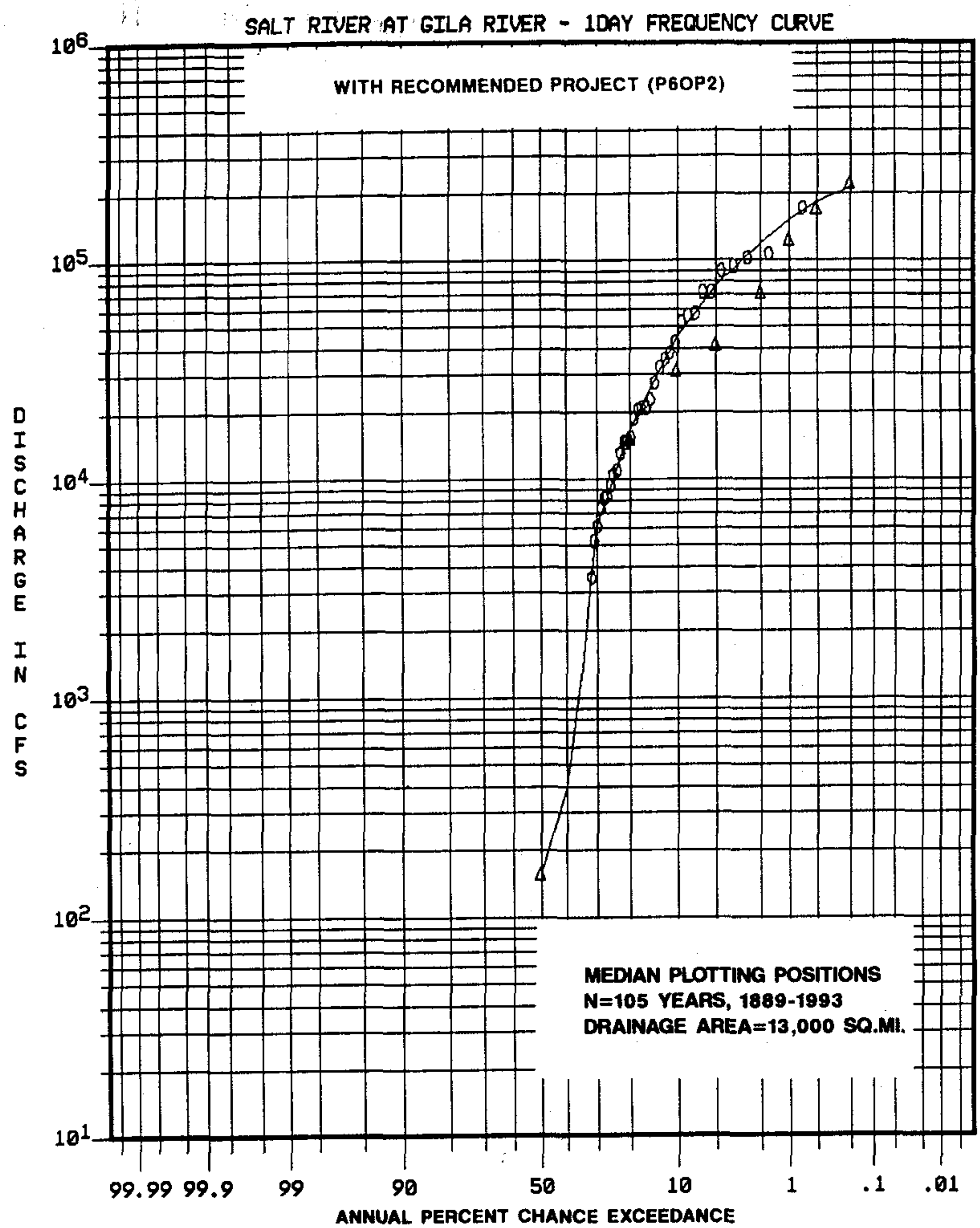

SALT RIVER AT GILA RIVER - VOLUME FREQUENCY CURVES
WITH RECOMMENDED PROJECT (P6OP2)
PEAK
1-DAY
2-DAY
3-DAY
5-DAY
10-DAY
1-MONTH
2-MONTH
3-MONTH
ADOPTED CURVES BASED UPON POR AND BHF
SIMULATIONS WITH 105 YEARS OF RECORD
MEDIAN PLOTTING POSITIONS
DA=13,000 SQ.MI.
DISCHARGE IN CFS
10^6
10^5
10^4
10^3
10^2
10^1
99.99 99.9 99 90 50 10 1 .1 .01
ANNUAL PERCENT CHANCE EXCEEDANCE

FIGURE 37-1



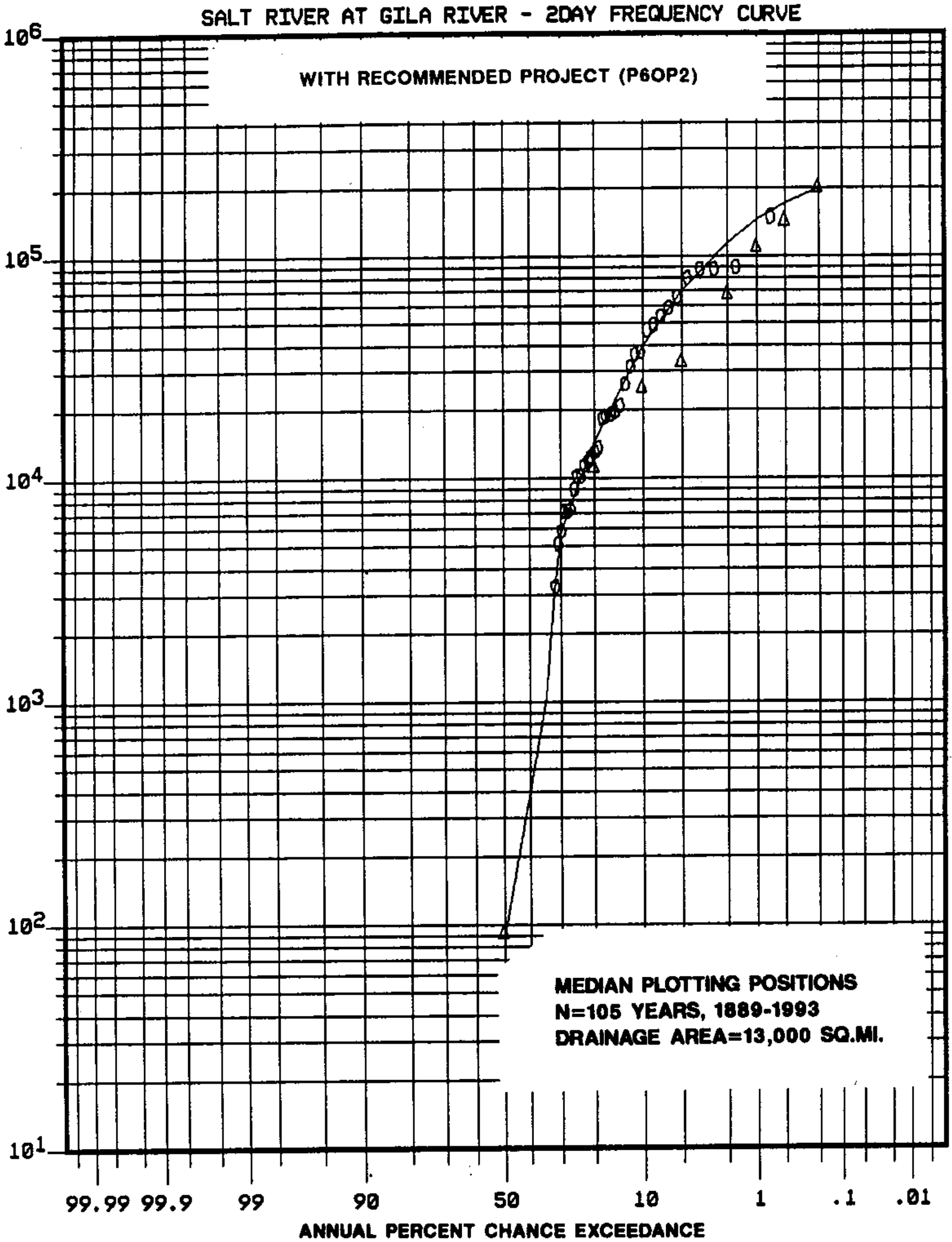
ADOPTED PEAK CURVE
○ - POR
△ - BHF

FIGURE 37-2



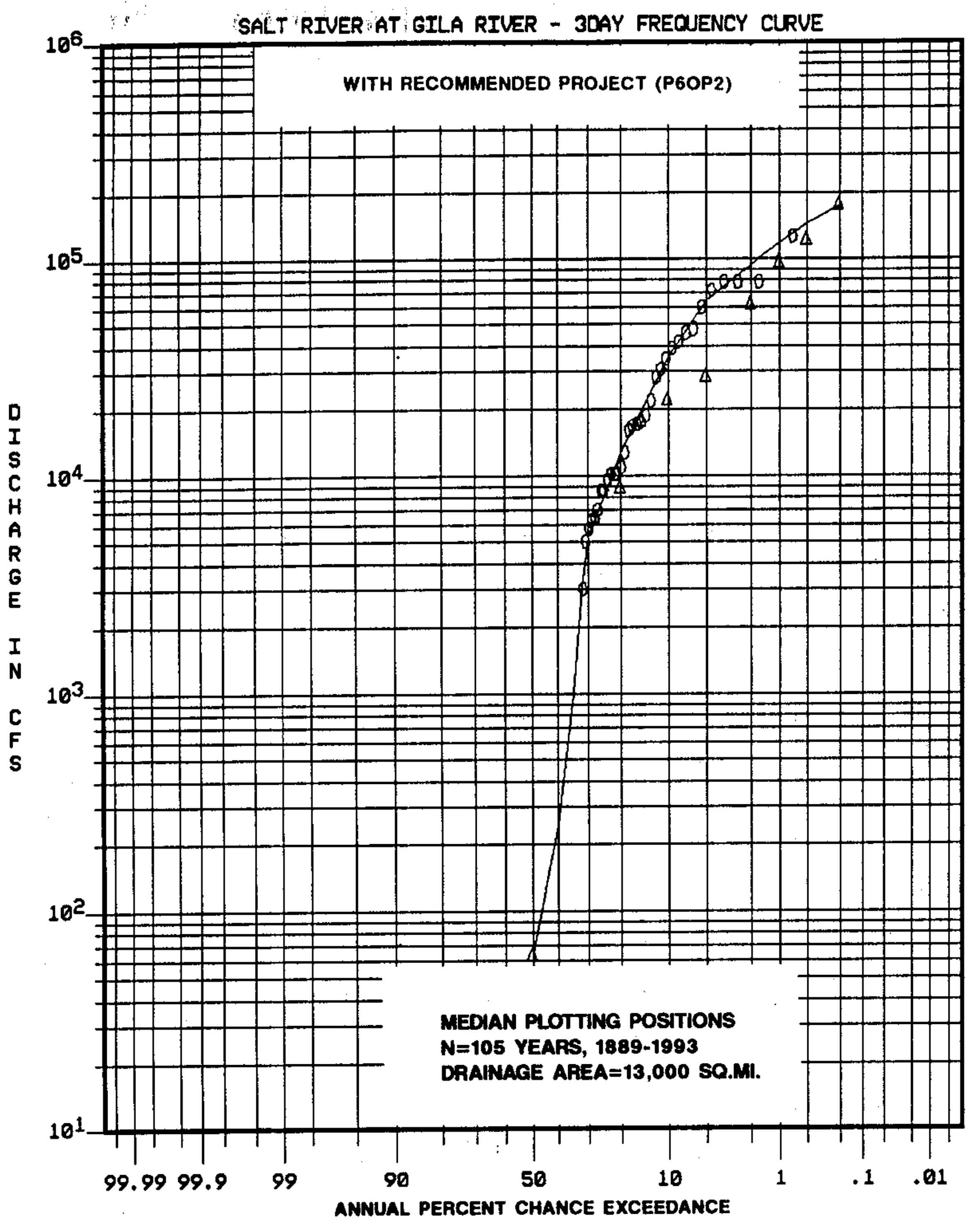
ADOPTED 1-DAY CURVE
○ - POR
△ - BHF

FIGURE 37-3



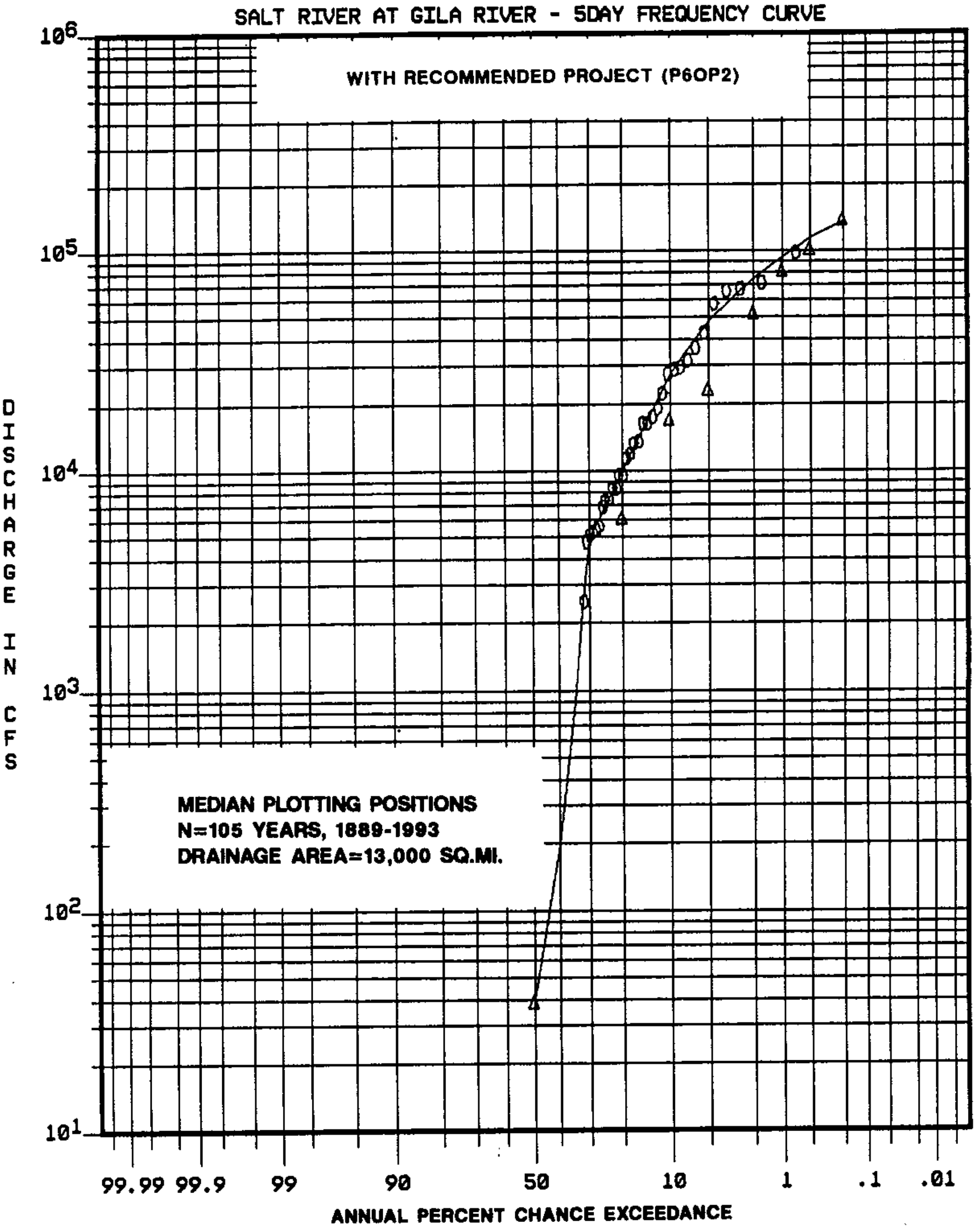
ADOPTED 2-DAY CURVE
○ - POR
△ - BHF

FIGURE 37-4



ADOPTED 3-DAY CURVE
○ - POR
△ - BHF

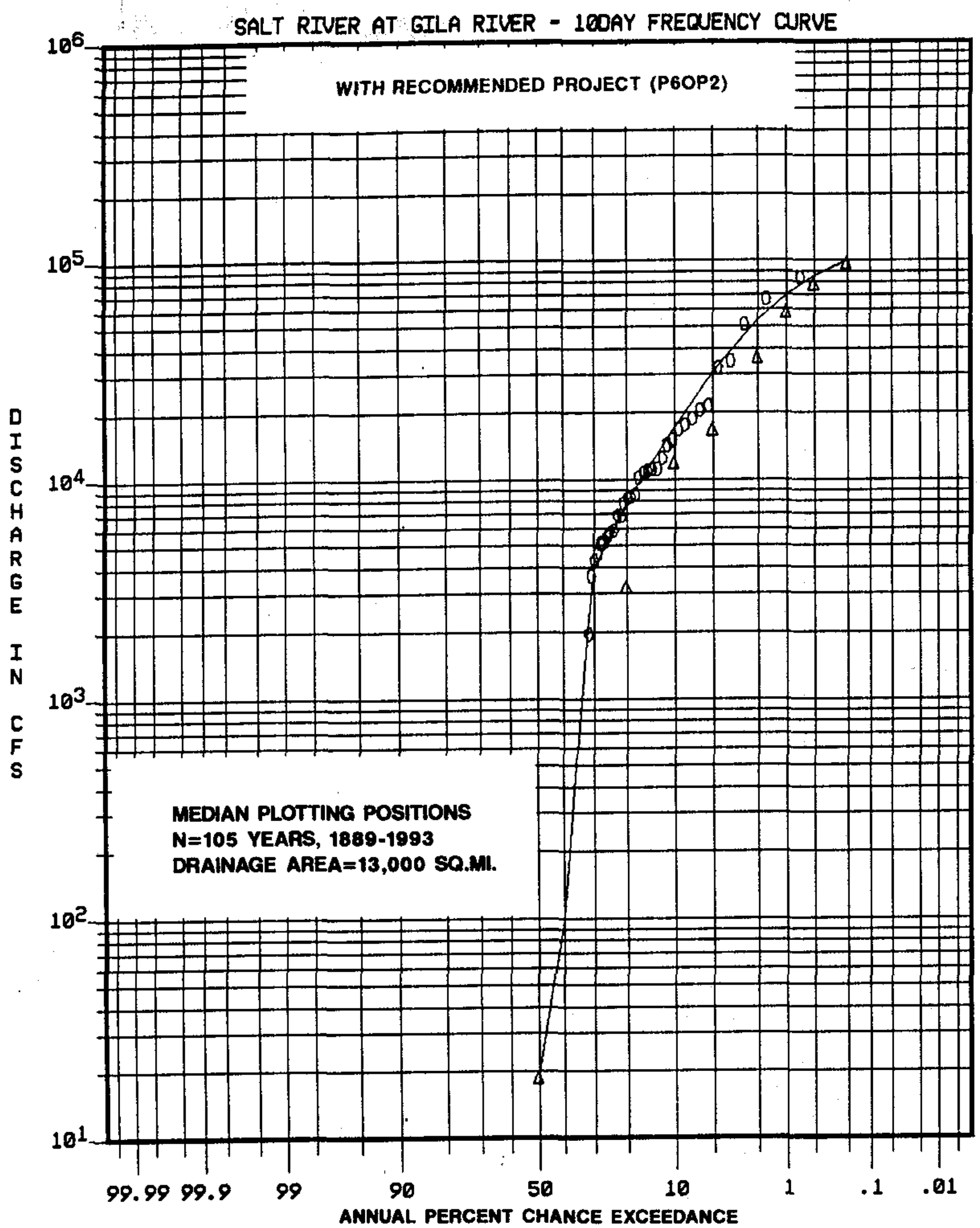
FIGURE 37-5



ADOPTED 5-DAY CURVE
○ - POR
△ - BHF

FIGURE 37-6

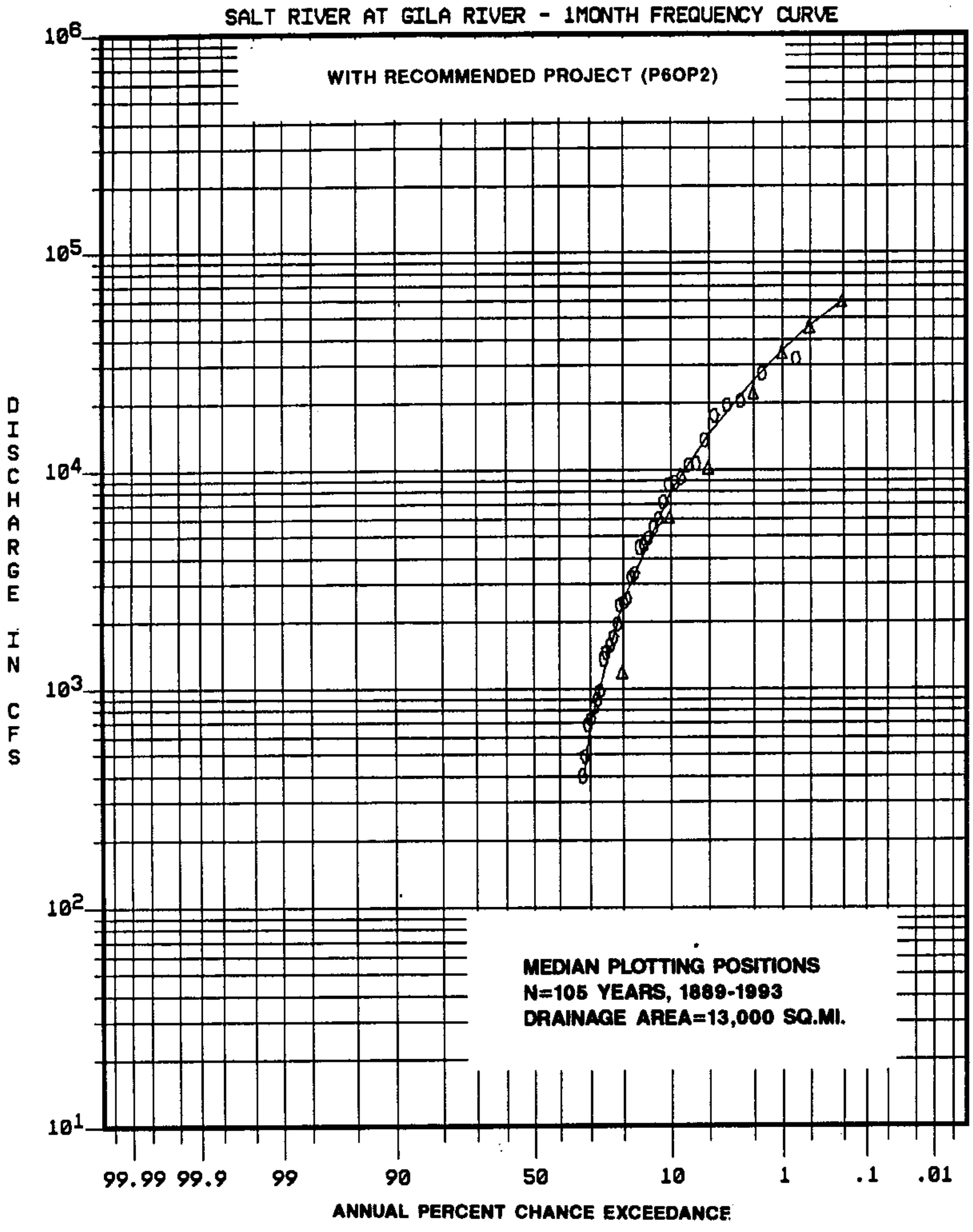
13JUN95 13:25:50



ADOPTED 10-DAY CURVE
○ - POR
△ - BHF

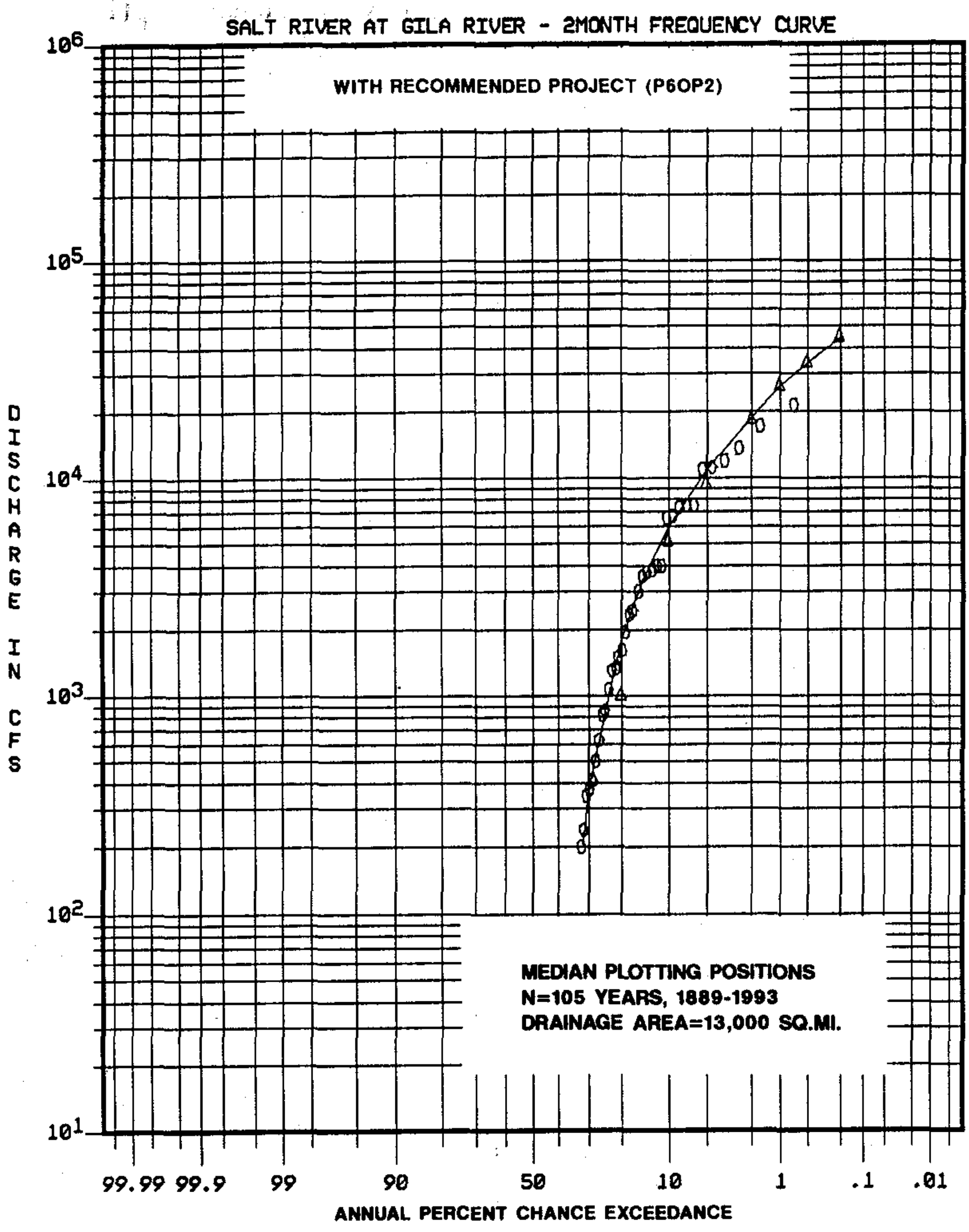
FIGURE 37-7

13JUN95 13:26:46



ADOPTED 1-MONTH CURVE
○ - POR
△ - BHF

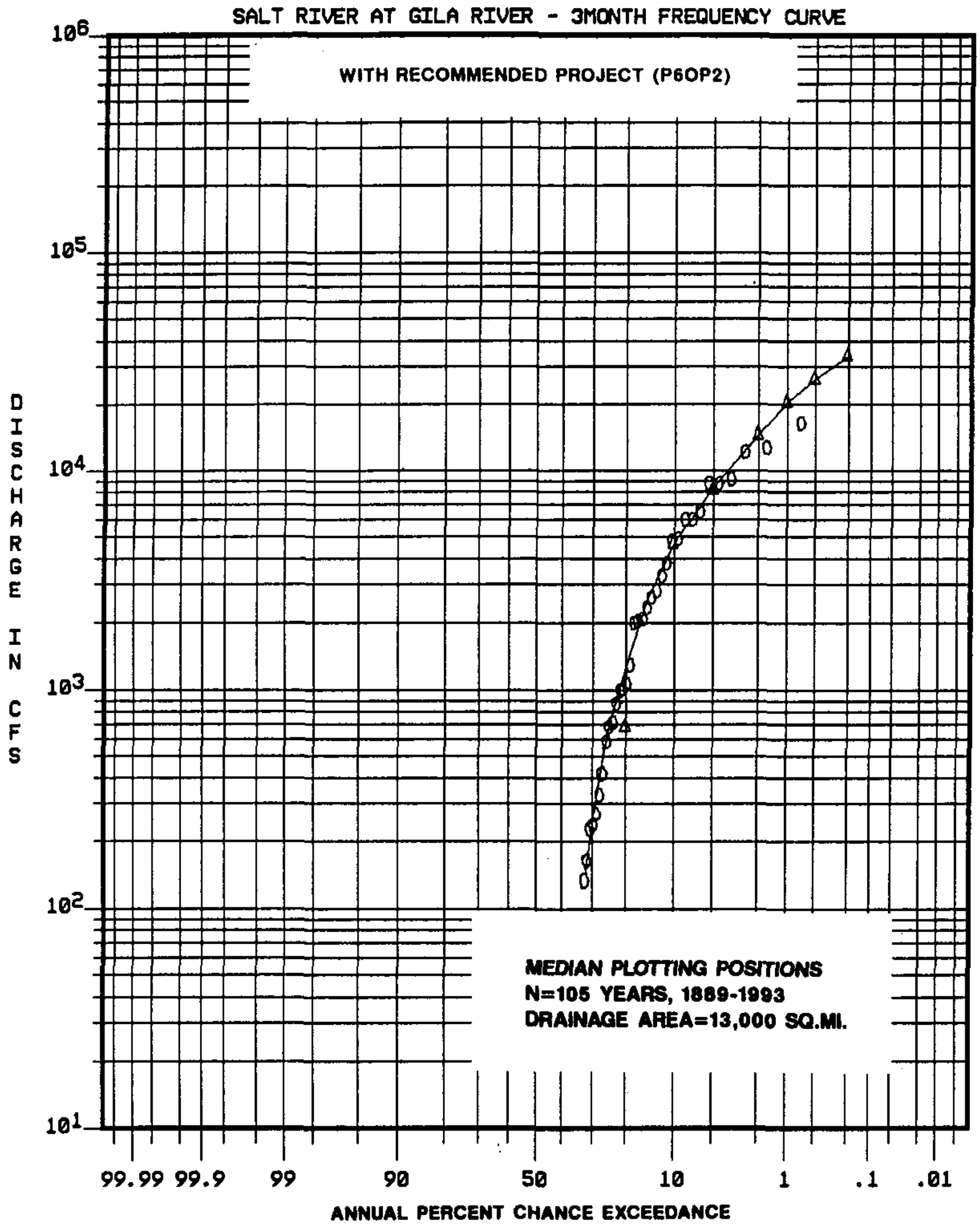
FIGURE 37-8



ADOPTED 2-MONTH CURVE
○ - POR
△ - BHF

FIGURE 37-9

13JUN95 13:28:38



ADOPTED 3-MONTH CURVE
○ - POR
△ - BHF

FIGURE 37-10

23JUN95 08:57:17

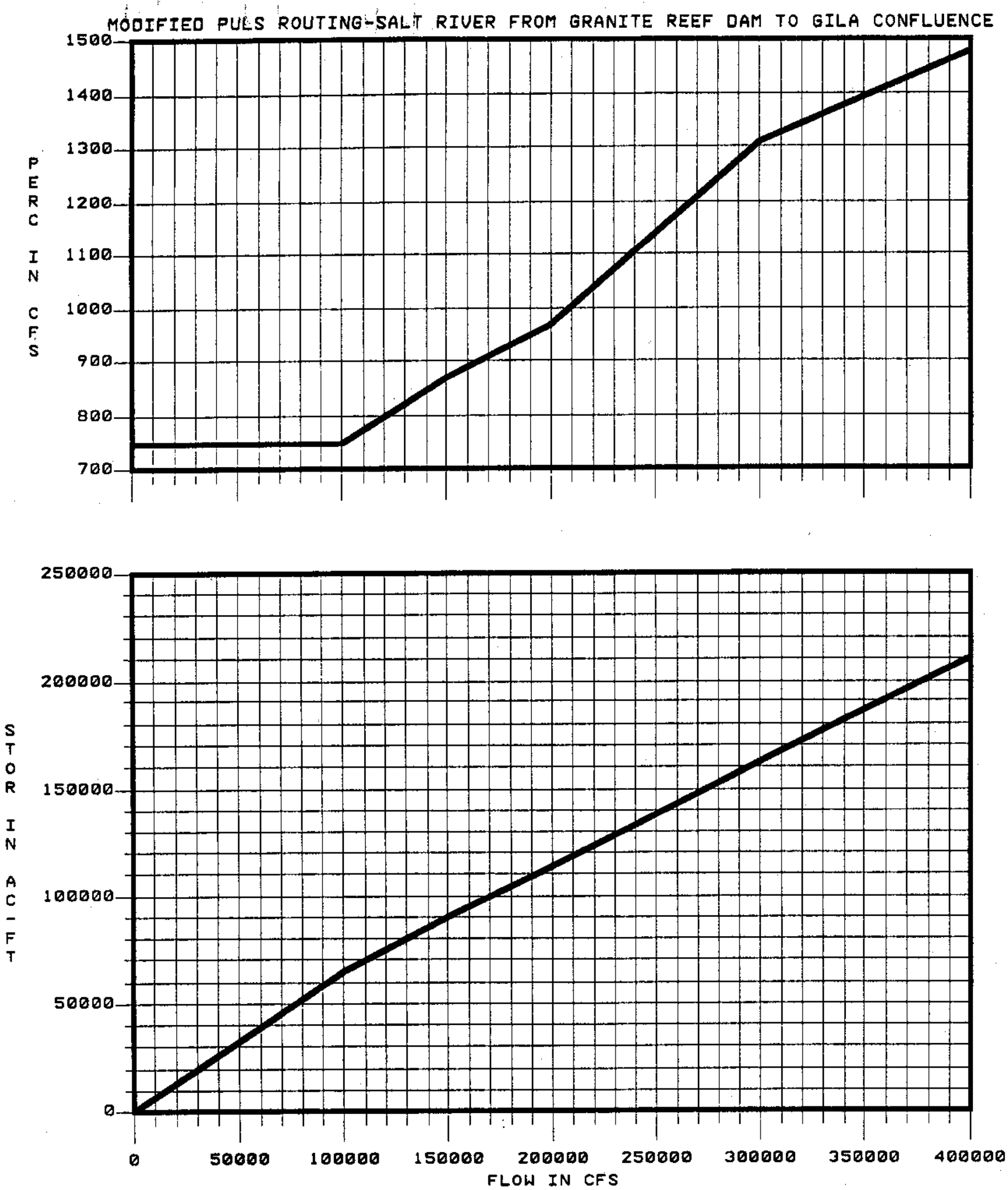


FIGURE 38-1

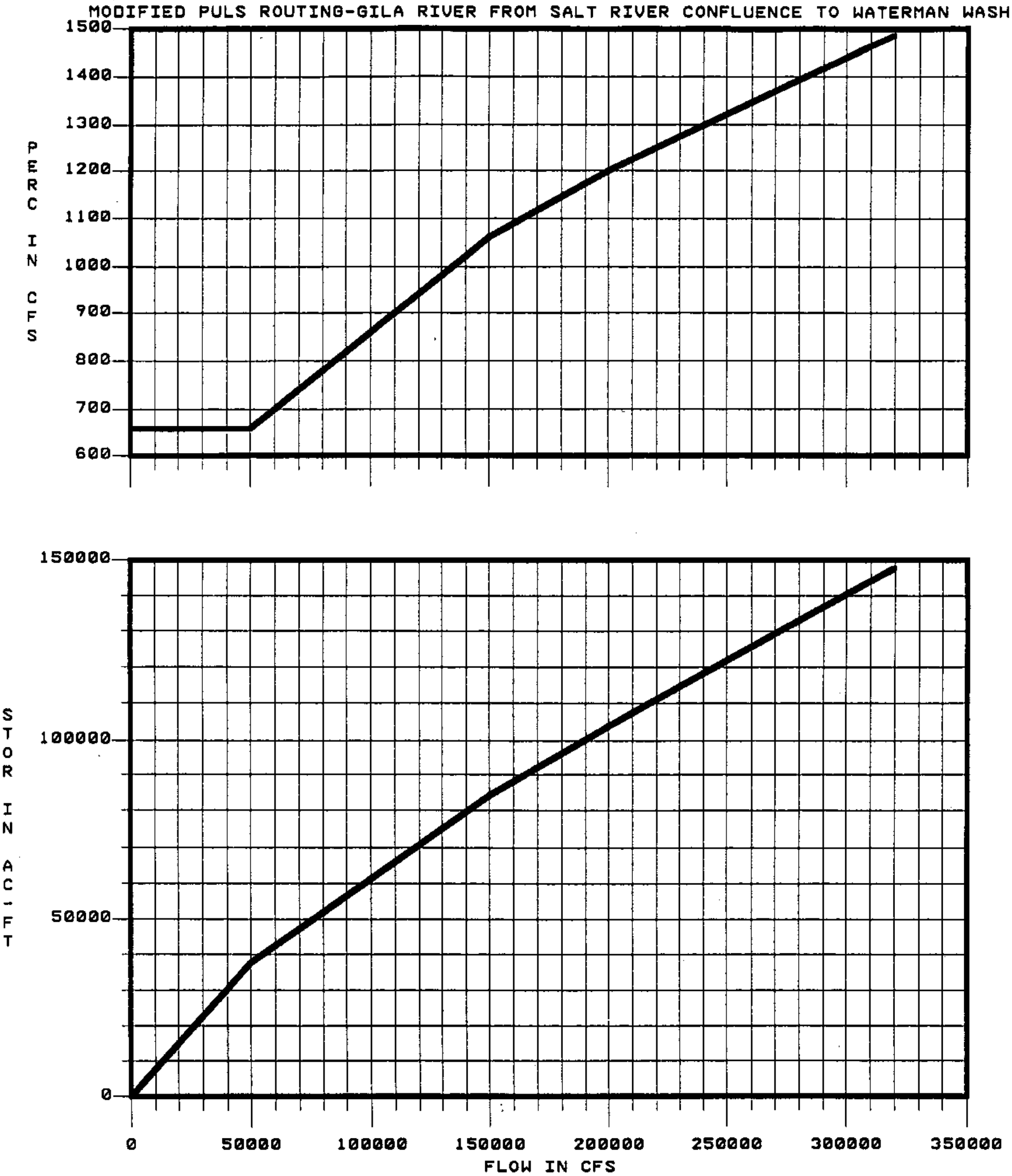

MODIFIED PULS ROUTING-GILA RIVER FROM SALT RIVER CONFLUENCE TO WATERMAN WASH
PERC IN CFS
1500
1400
1300
1200
1100
1000
900
800
700
600
STOR IN AC-FT
150000
100000
50000
0
0
50000
100000
150000
200000
250000
300000
350000
FLOW IN CFS

FIGURE 38-2

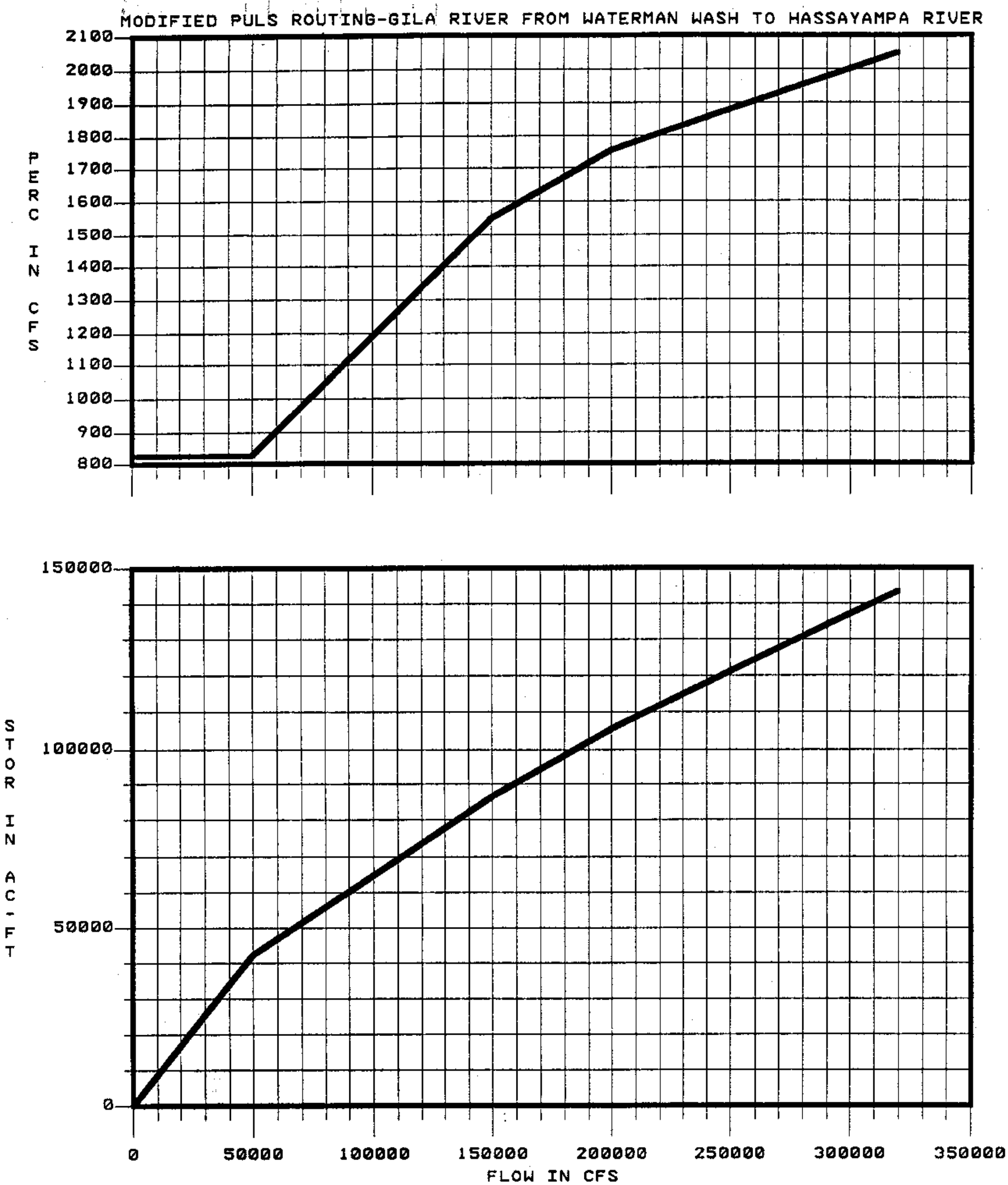

MODIFIED PULS ROUTING-GILA RIVER FROM WATERMAN WASH TO HASSAYAMPA RIVER
PERC IN CFS
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
STOR IN AC-FT
150000
100000
50000
0
0
50000
100000
150000
200000
250000
300000
350000
FLOW IN CFS

FIGURE 38-3

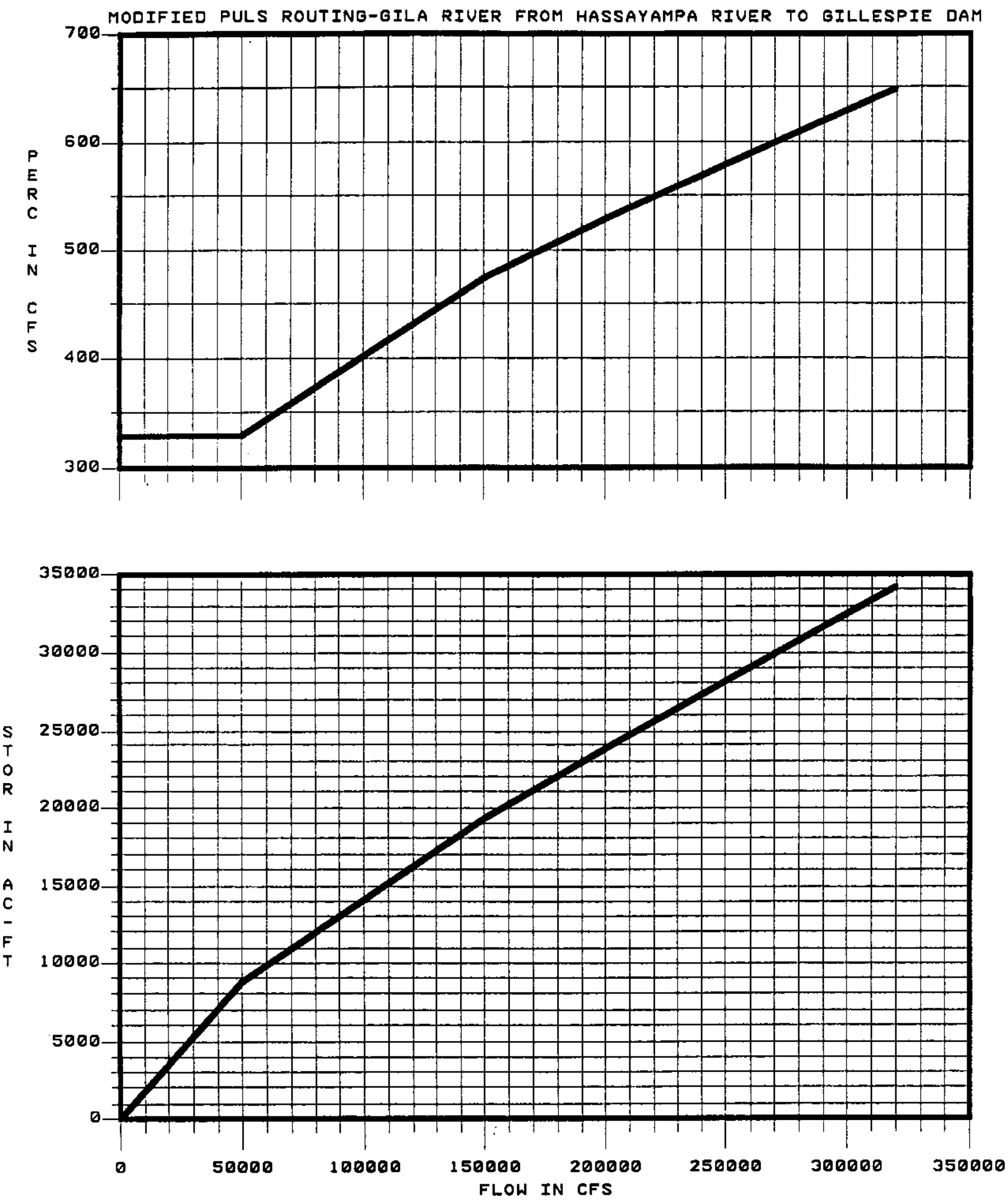

MODIFIED PULS ROUTING-GILA RIVER FROM HASSAYAMPA RIVER TO GILLESPIE DAM
PERC IN CFS
700
600
500
400
300
STOR IN AC-FT
35000
30000
25000
20000
15000
10000
5000
0
0
50000
100000
150000
200000
250000
300000
350000
FLOW IN CFS

FIGURE 38-4

SECTION 7 STUDY: GILA RIVER ROUTING RELATIONSHIPS, in cfs

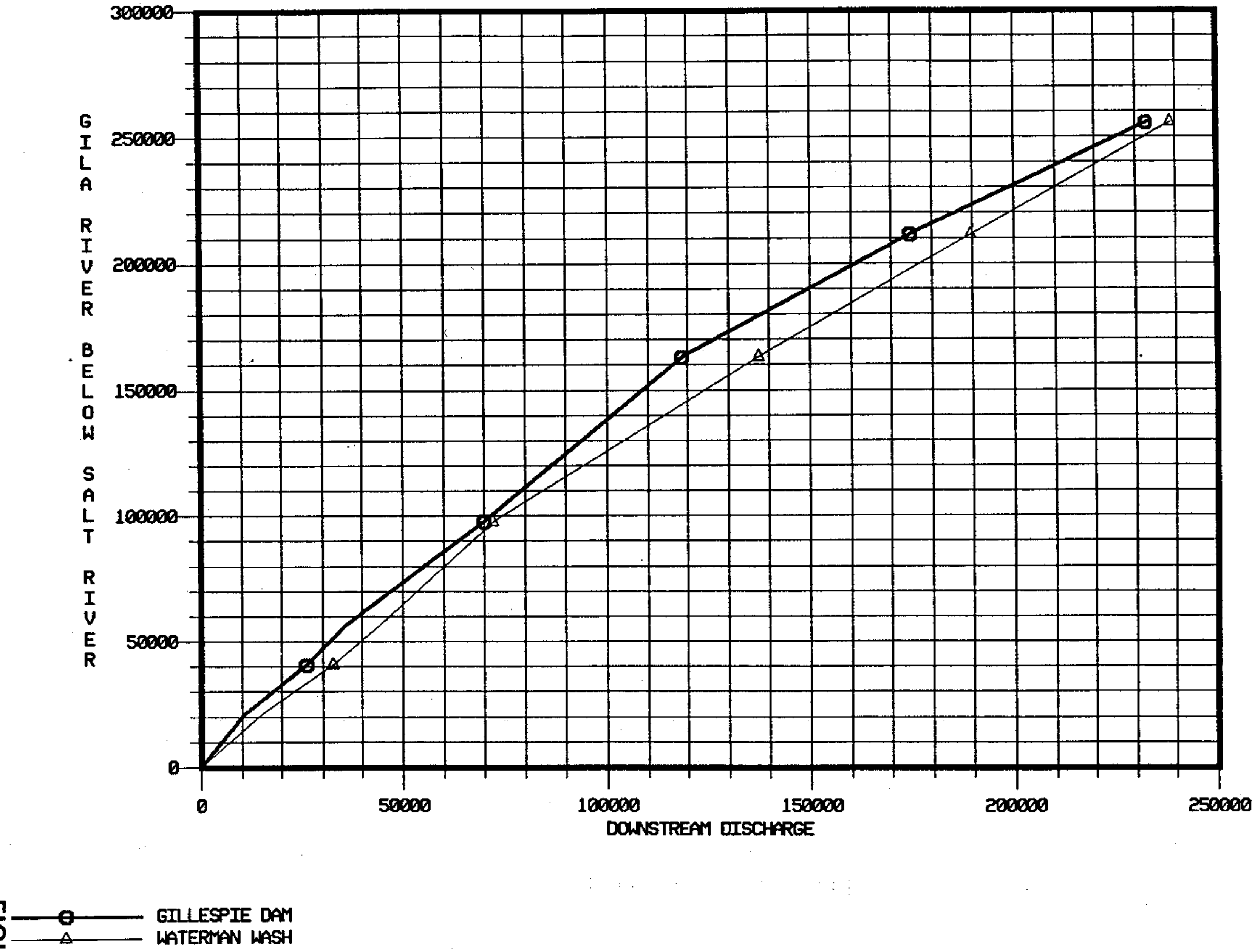
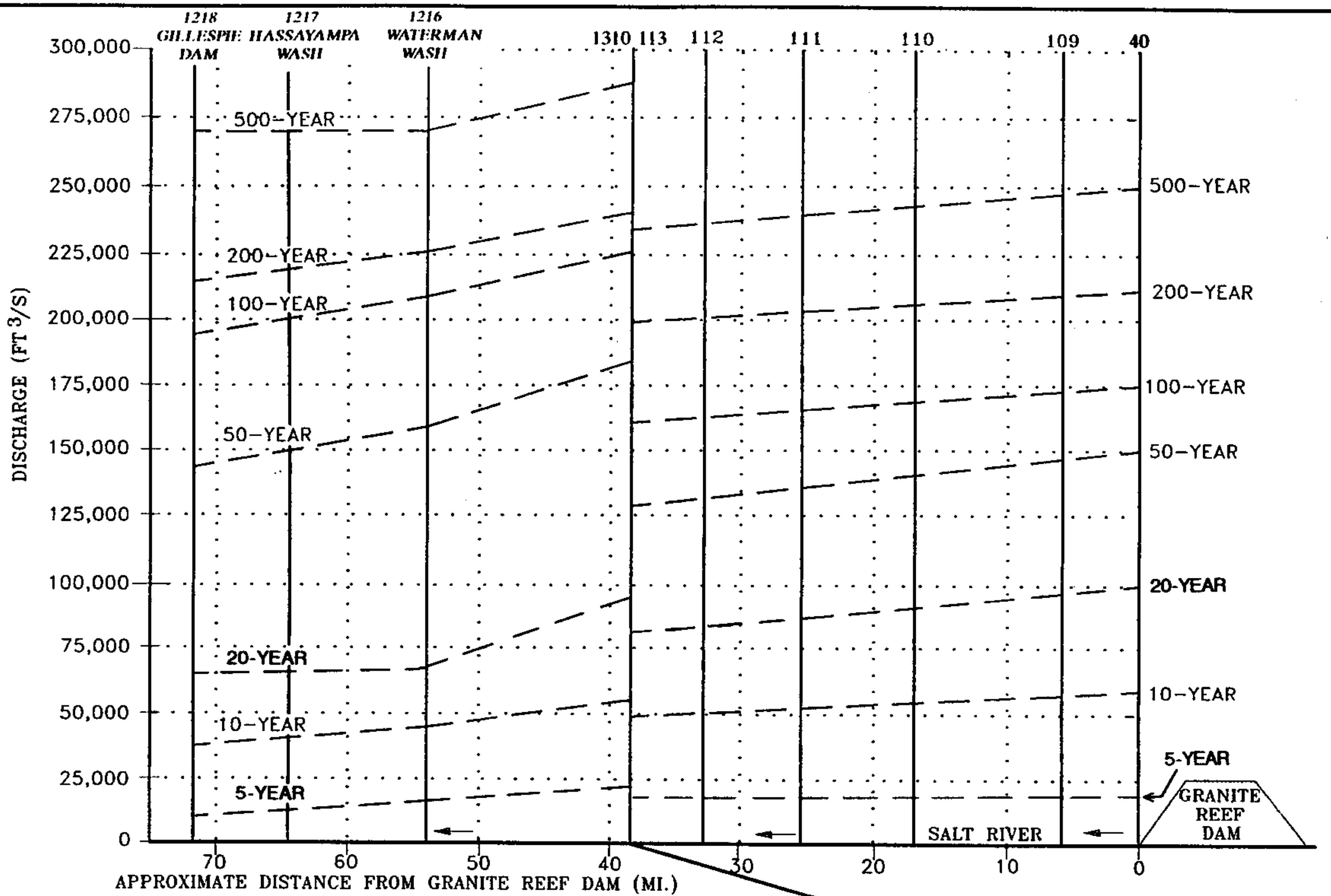


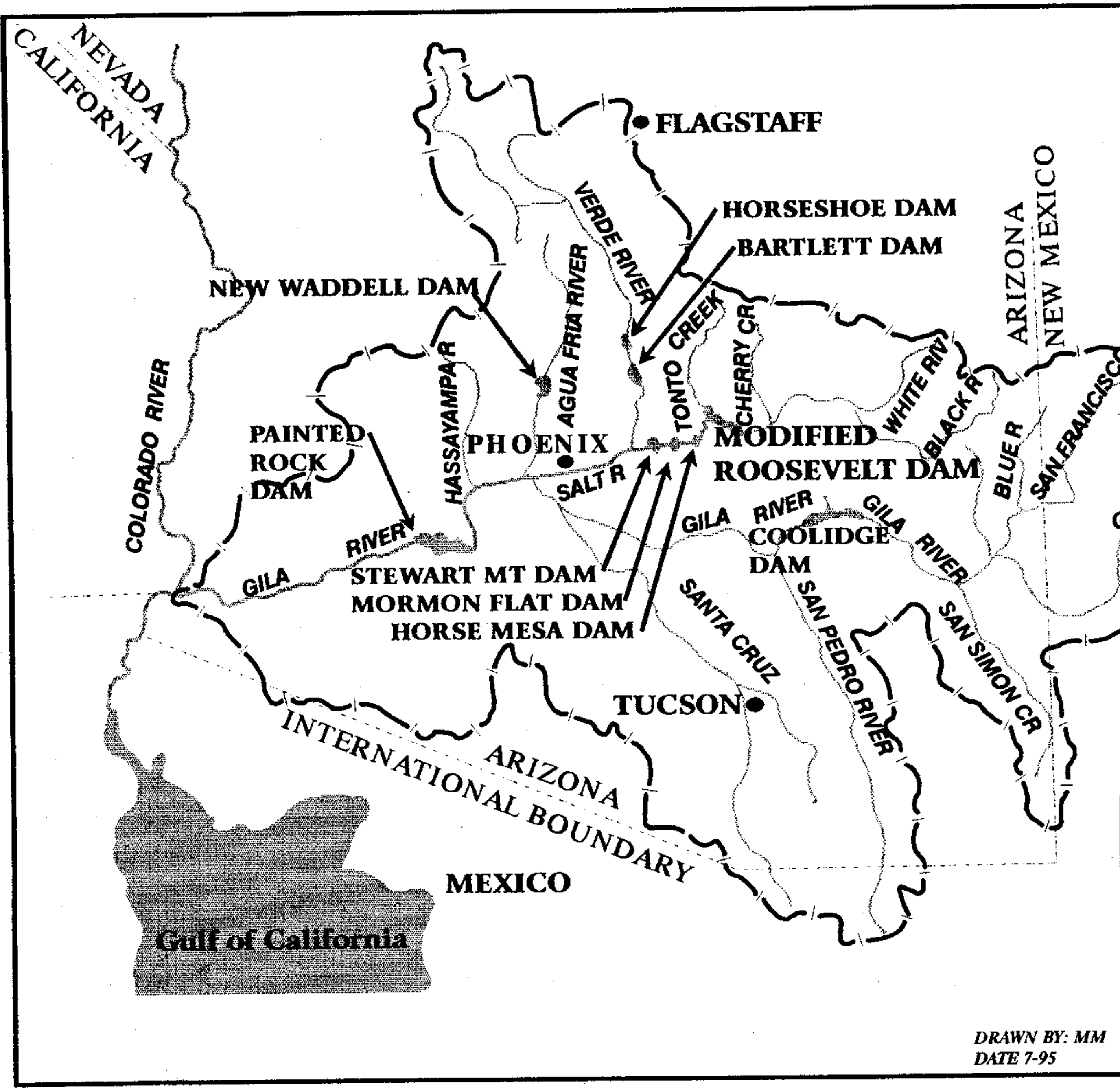
FIGURE 39



CP	LOCATION
40	GRANITE REEF DAM
109	GILBERT ROAD
110	TEMPE BRIDGE
111	CENTRAL AVENUE
112	67TH AVENUE
113	GILA CONFLUENCE

DISCHARGE FREQUENCY PROFILE
SALT RIVER BELOW GRANITE REEF DIVERSION DAM
TO GILA RIVER AT GILLESPIE DAM W/ RECOMMENDED PLAN (P6OP2)

FIGURE 40

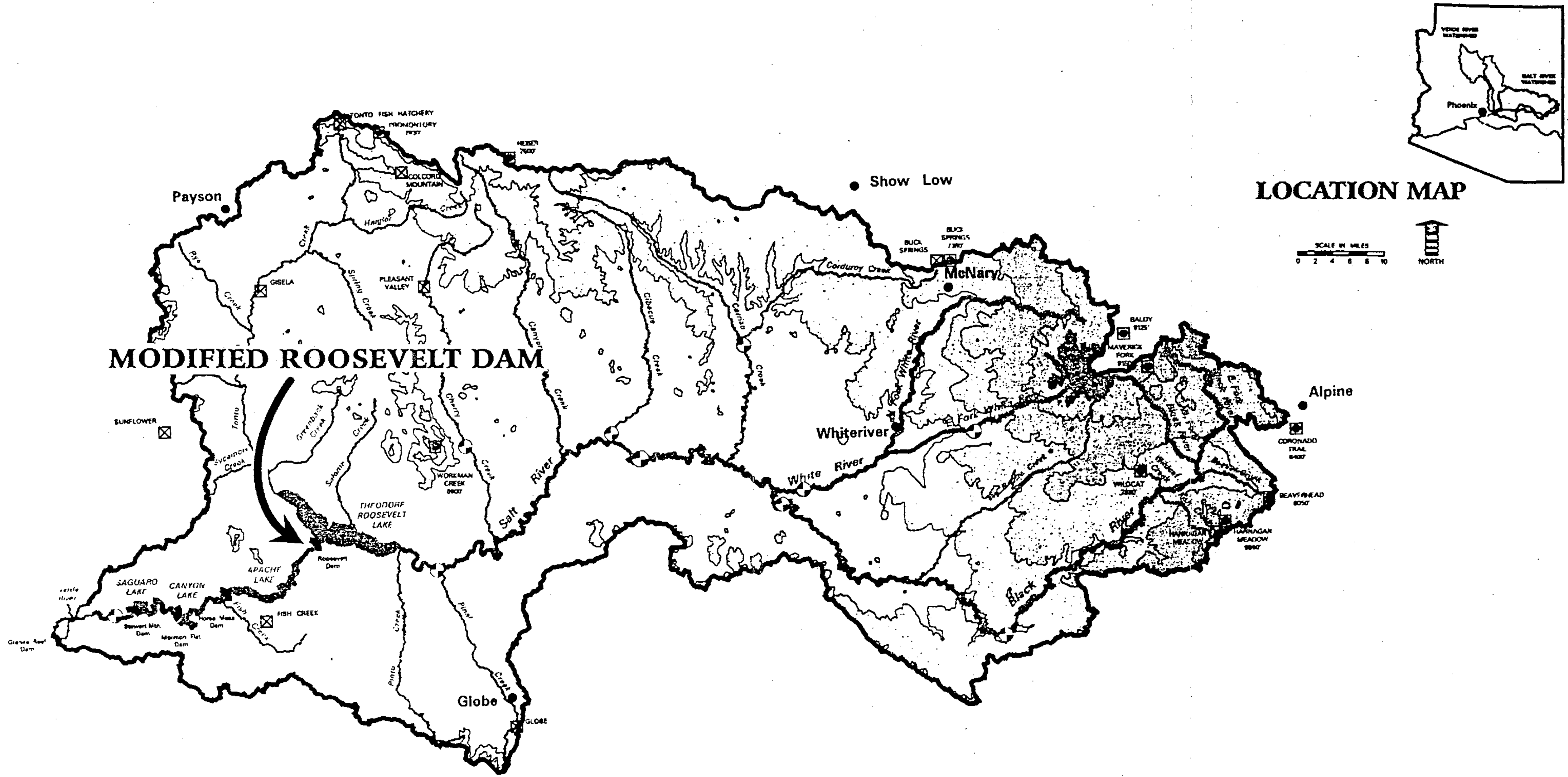


MODIFIED ROOSEVELT DAM
SALT RIVER , ARIZONA
SECTION 7 STUDY

GILA RIVER BASIN
ARIZONA

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 1

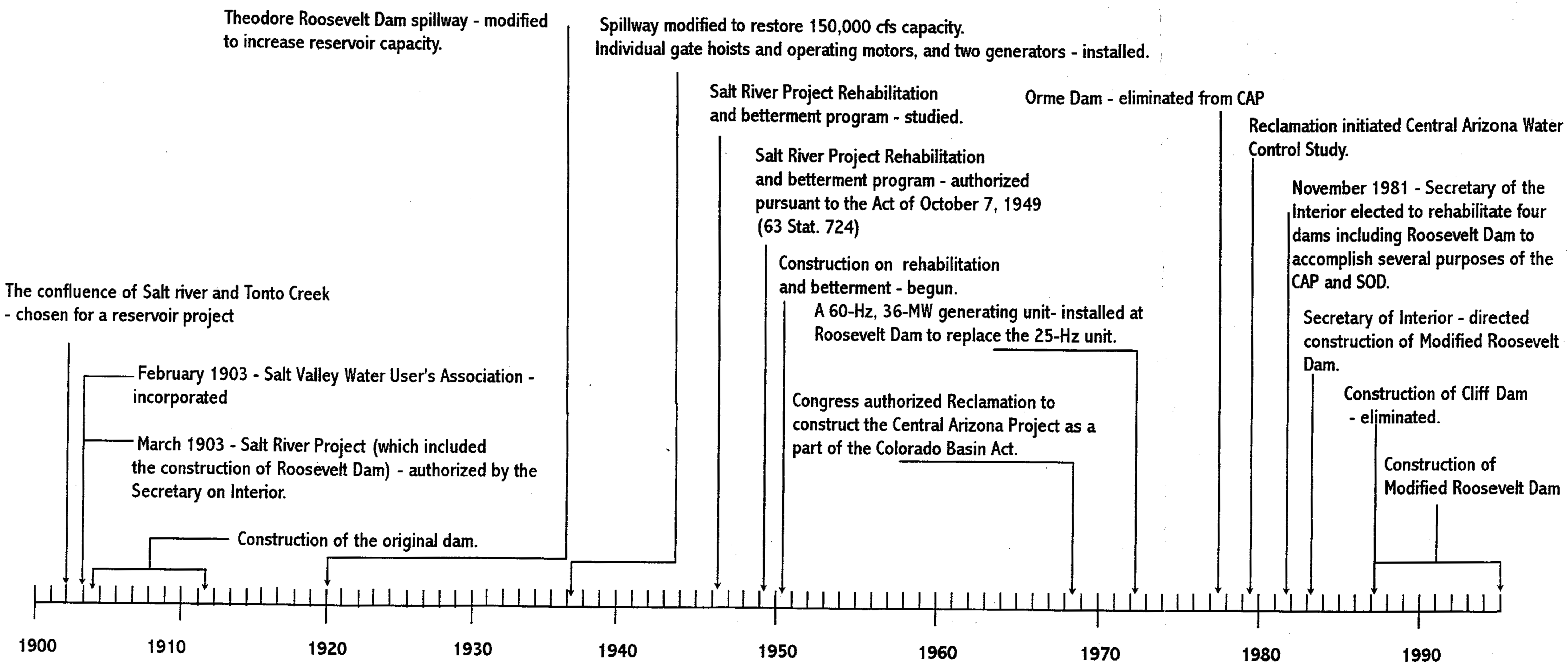


NOTE: See plate 5-1 for hydrometeorological stations located within the Salt River watershed.

MODIFIED ROOSEVEL DAM
SALT RIVER, ARIZONA
SECTION 7 STUDY

MODIFIED ROOSEVELT DAM PROJECT LOCATION AND VICINITY MAP

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



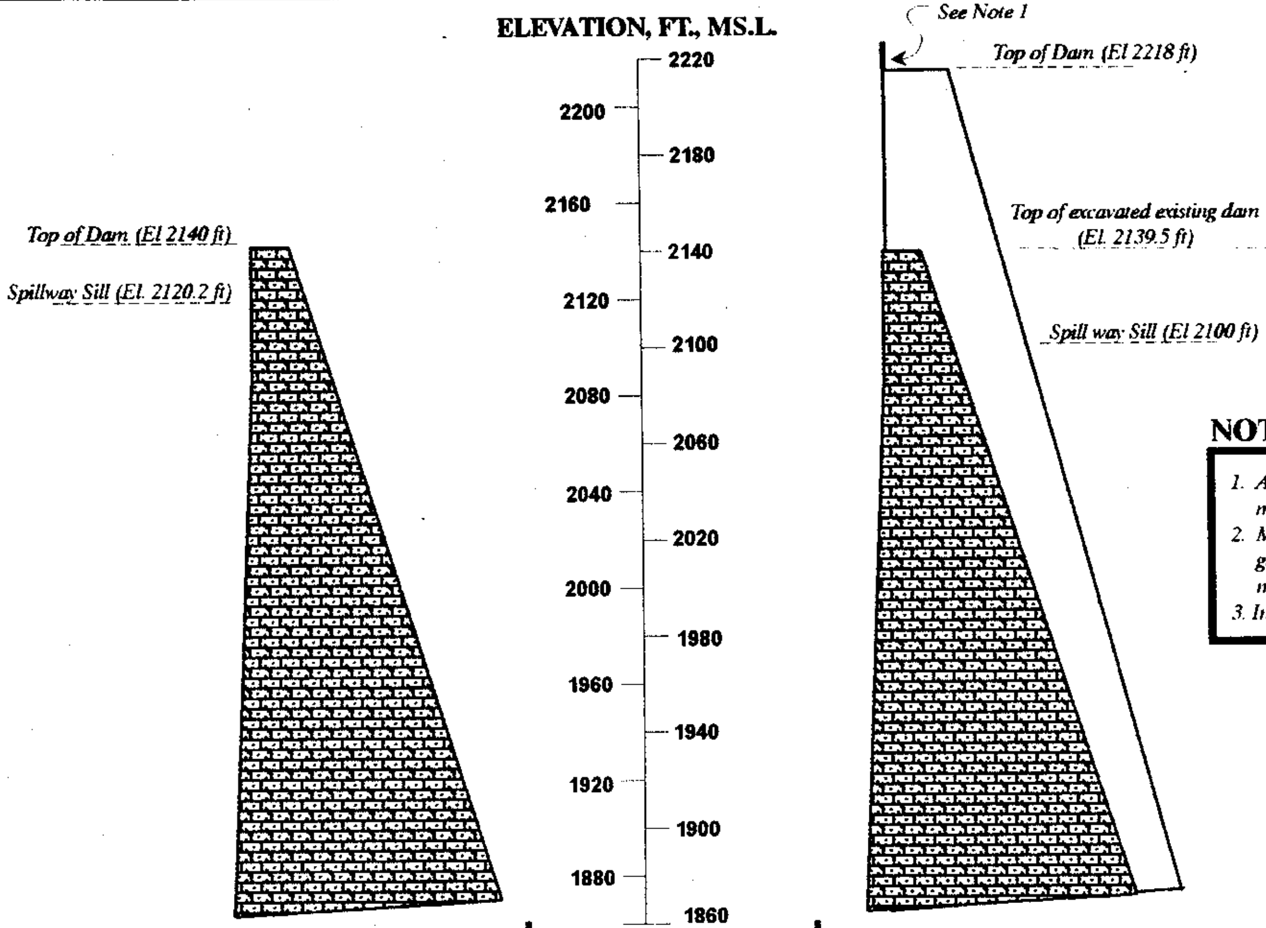
SOURCE: DESIGN SUMMARY - THEODORE ROOSEVELT DAM MODIFICATION, SALT RIVER PROJECT, AZ UNITED STATES BUREAU OF RECLAMATION JULY 1991

DRAWN BY:MM
DATE:7-95

MODIFIED ROOSEVEL DAM
SALT RIVER, ARIZONA
SECTION 7 STUDY

MODIFIED ROOSEVELT DAM TIME-LINE

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



LEGEND

- Original dam; constructed of masonry.
- Section added during modification; constructed of mass concrete blocks.

NOTES

1. A 4.5 ft parapet wall is constructed along the crest of the modified dam.
2. Maximum capacity of 150,000 cfs - at WSE 2187.6 ft with all gates wide open; above this elevation, 150,000 cfs is maintained by adjusting the gates.
3. Includes power plant bypass.

N.T.S.

ORIGINAL DAM		MODIFIED DAM
1905 - 1911	**Construction Date**	1987 - 1995
280	**Structural Height, ft.**	357
16	**Top Width, ft.**	21.6
723	**Crest Length, ft.**	1210
(19) 20'x15.9' Radial Gates Max. Cap. = 150,000 cfs	**Spillway Structure**	(4) 21'x30' Top Seal Radial Gates Max. Cap. = 150,000 cfs (see note 2)
(1) 66" ring jet valve 3,160 cfs	**River Outlet Works**	(4) 90" jet-flow gates & ring follower gate 11,700 cfs (see note 3)
36 MW Design Discharge = 2,400 cfs	**Power Plant**	36 MW Design Discharge = 2,400 cfs

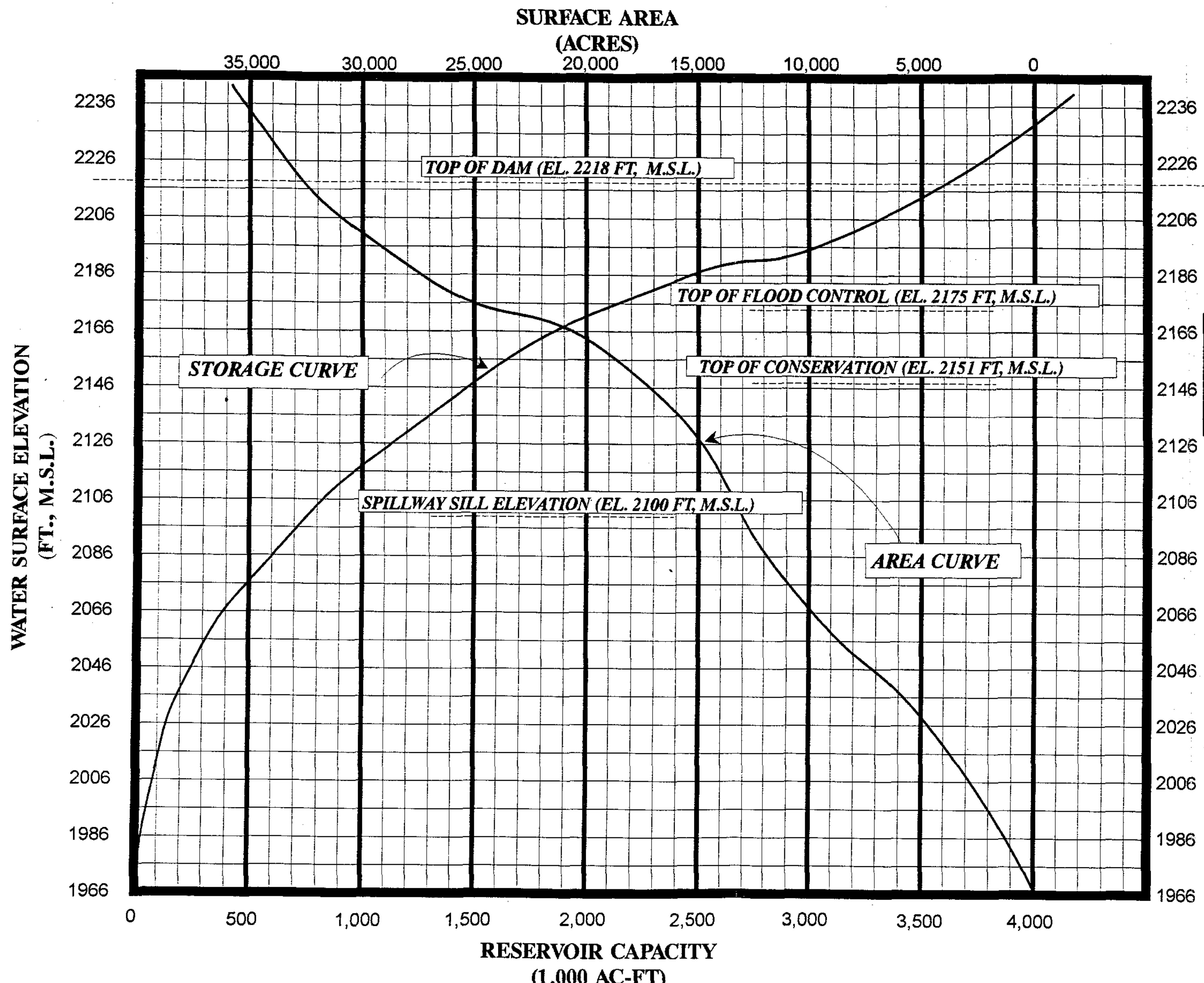
DRAWN BY: MM
DATE: 7-95

MODIFIED ROOSEVELT DAM
SALT RIVER, ARIZONA
SECTION 7 STUDY

MODIFIED ROOSEVELT DAM
COMPARISON DIAGRAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 4



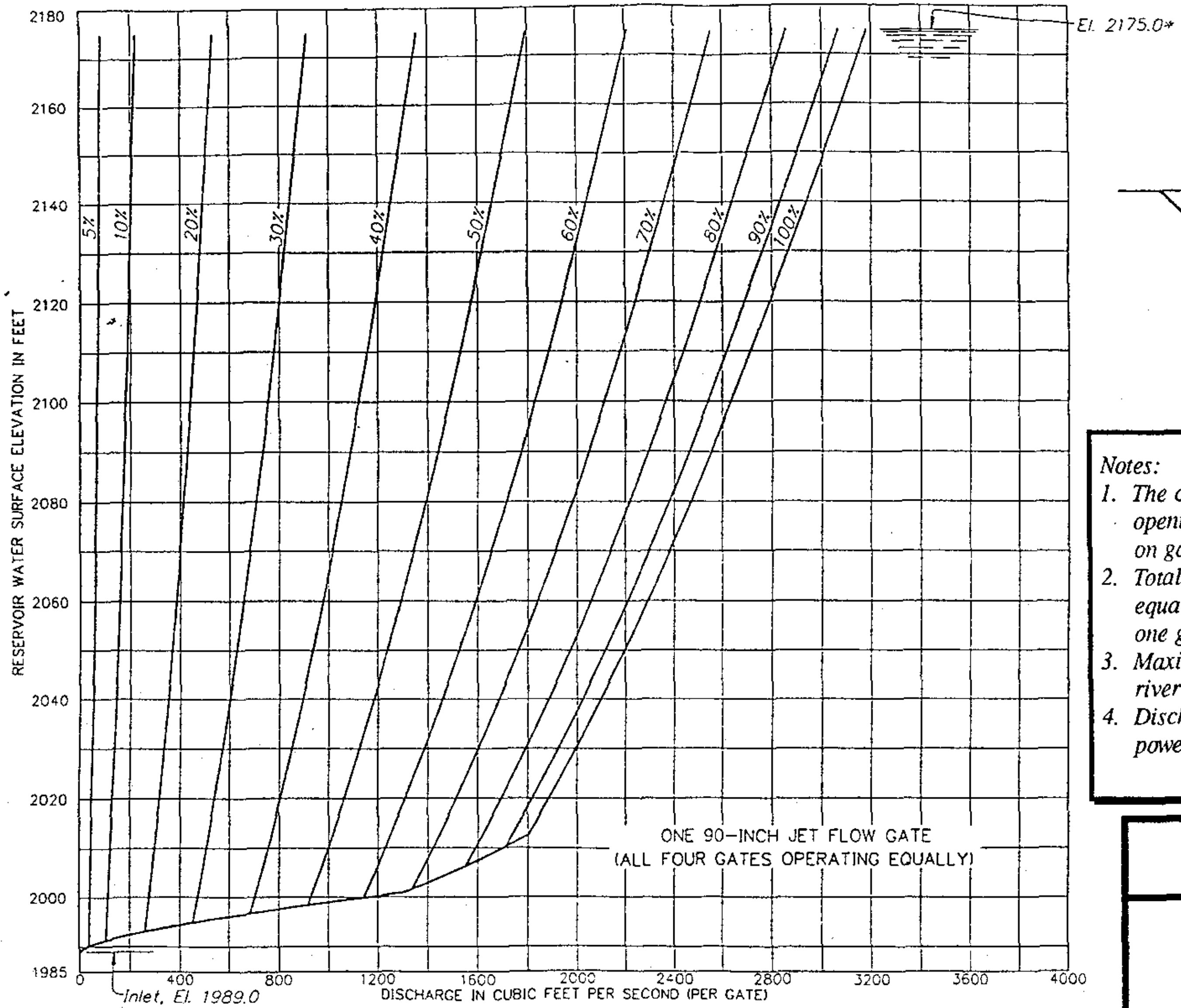
NOTES:
1. BASED ON 1981 SEDIMENT SURVEY.
2. VOLUME COMPUTATION - JANUARY 1982.
3. FOR TABULATIONS, SEE EXHIBIT C OF THIS MANUAL.

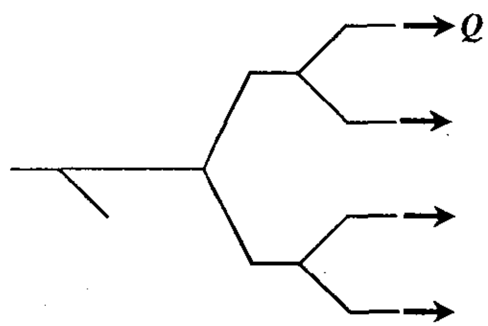
DRAWN BY: MM
DATE: 7-95

MODIFIED ROOSEVELT DAM
SALT RIVER, ARIZONA
SECTION 7 STUDY

ROOSEVELT RESERVOIR AREA - CAPACITY CURVES

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISCTRICT





Notes:

1. *The curves are for percentages of the maximum opening for one 90-inch jet flow gate, based on gate travel.*
2. *Total discharge of all four jet flow gates equals four times the discharge shown for one gate.*
3. *Maximum allowable reservoir elevation for river outlet works operation is 2175 ft.**
4. *Discharge curves assume no flow to the powerplant.*

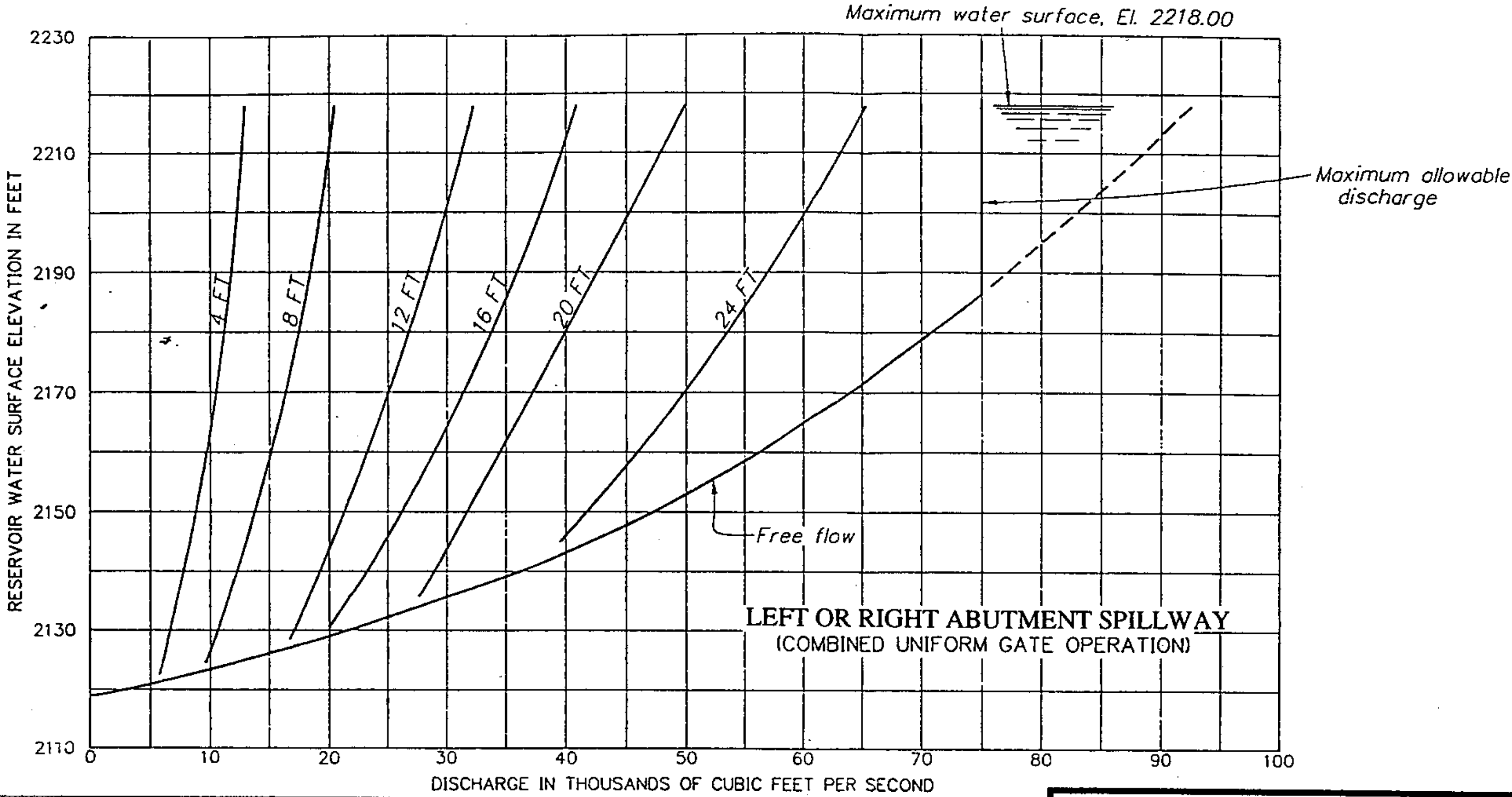
MODIFIED ROOSEVELT DAM
SALT RIVER, ARIZONA
SECTION 7 STUDY

Modified Roosevelt Dam Outlet Works Discharge Rating Curves

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

DRAWN BY: MM
DATE: 7-95

SOURCE: *US Bureau of Reclamation*
Design Operating Criteria, Theodore Roosevelt Dam
Salt River Project, AZ , June 1994



NOTES:

1.. The curves are for various gate openings for 21'X30' radial gates. Gate openings are measured normal to spillway slopes.
2. The curves are applicablle for either left abutment or right abutment spillway.
3. Spillway sill is at elevation 2100 ft, m.s.l. However, approach channel invert is at higher elevation (approx. 2118.75 ft) therefore, spillway flow starts above 2118.75 ft.

SOURCE: *US Bureau of Reclamation*
Design Operating Criteria, Theodore Roosevelt Dam
Salt River Project, AZ , June 1994

DRAWN BY: MM
DATE: 7-95

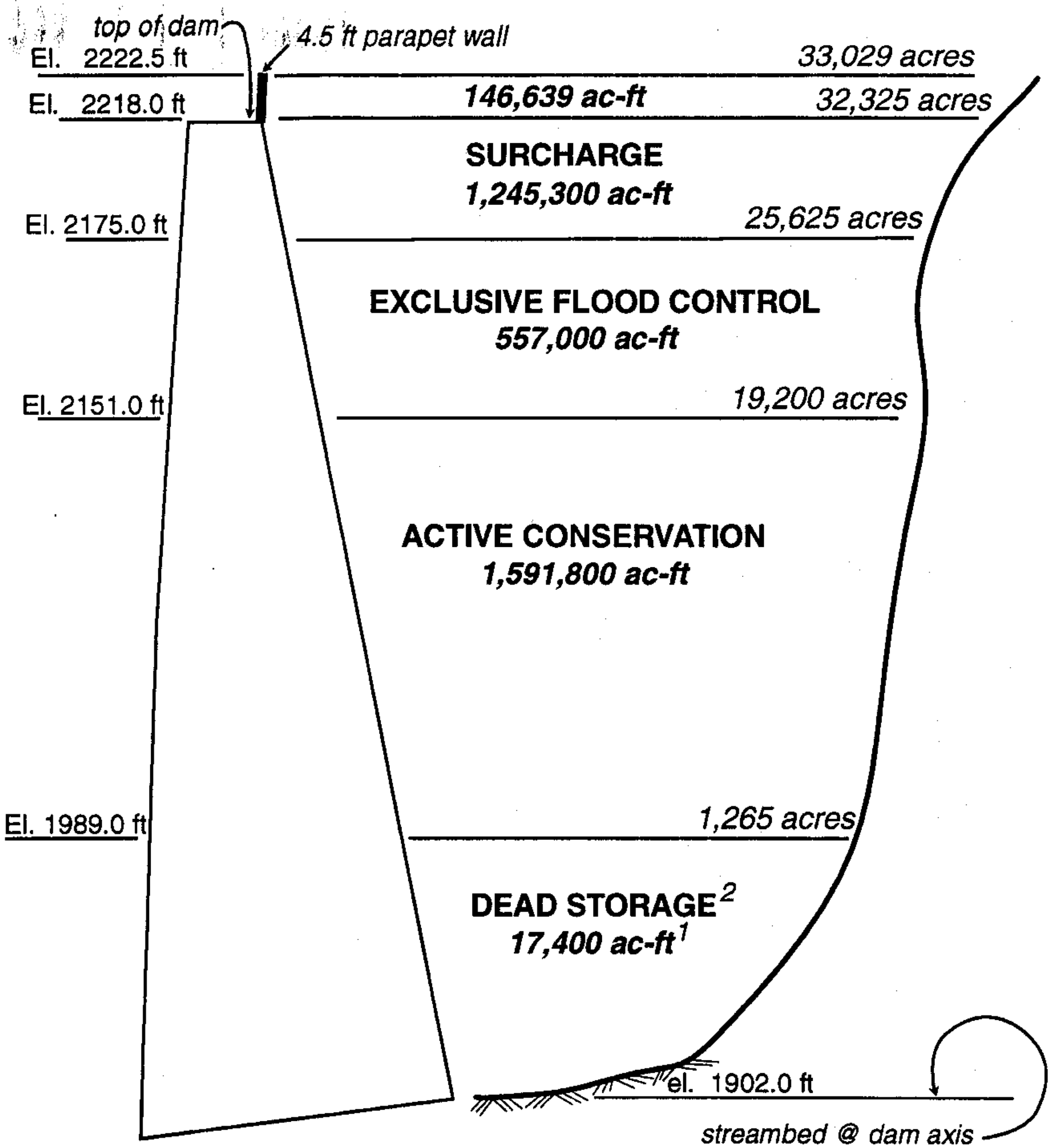
MODIFIED ROOSEVELT DAM
SALT RIVER, ARIZONA
SECTION 7 STUDY

Modified Roosevelt Dam Spillway Structure Discharge Rating Cure

(FOR EITHER LEFT OR RIGHT ABUTMENT SPILLWAY)

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 7



NOTES:

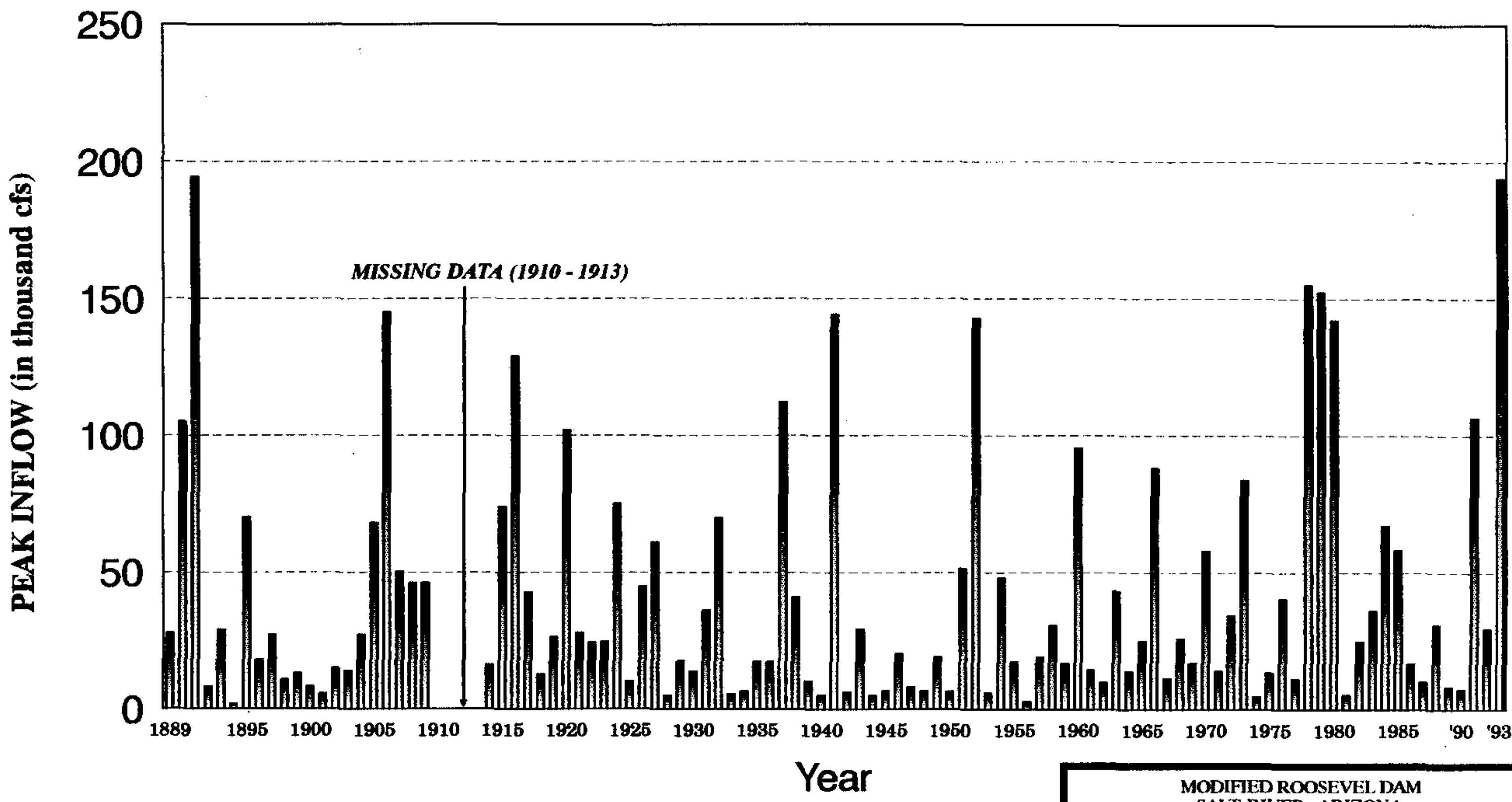
1. *Capacities taken from 1982 updates of the 1981 Area-Capacity Tables which are based on 1981 sediment survey.*
2. *Top of dead storage - based on estimated sediment depth by year 2094 of 87 ft.*

MODIFIED ROOSEVELT DAM
SALT RIVER, ARIZONA
SECTION 7 STUDY

MODIFIED ROOSEVELT DAM STORAGE ALLOCATION DIAGRAM

DRAWN BY:MM
DATE: 7-95

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT



MODIFIED ROOSEVEL DAM
SALT RIVER, ARIZONA
SECTION 7 STUDY

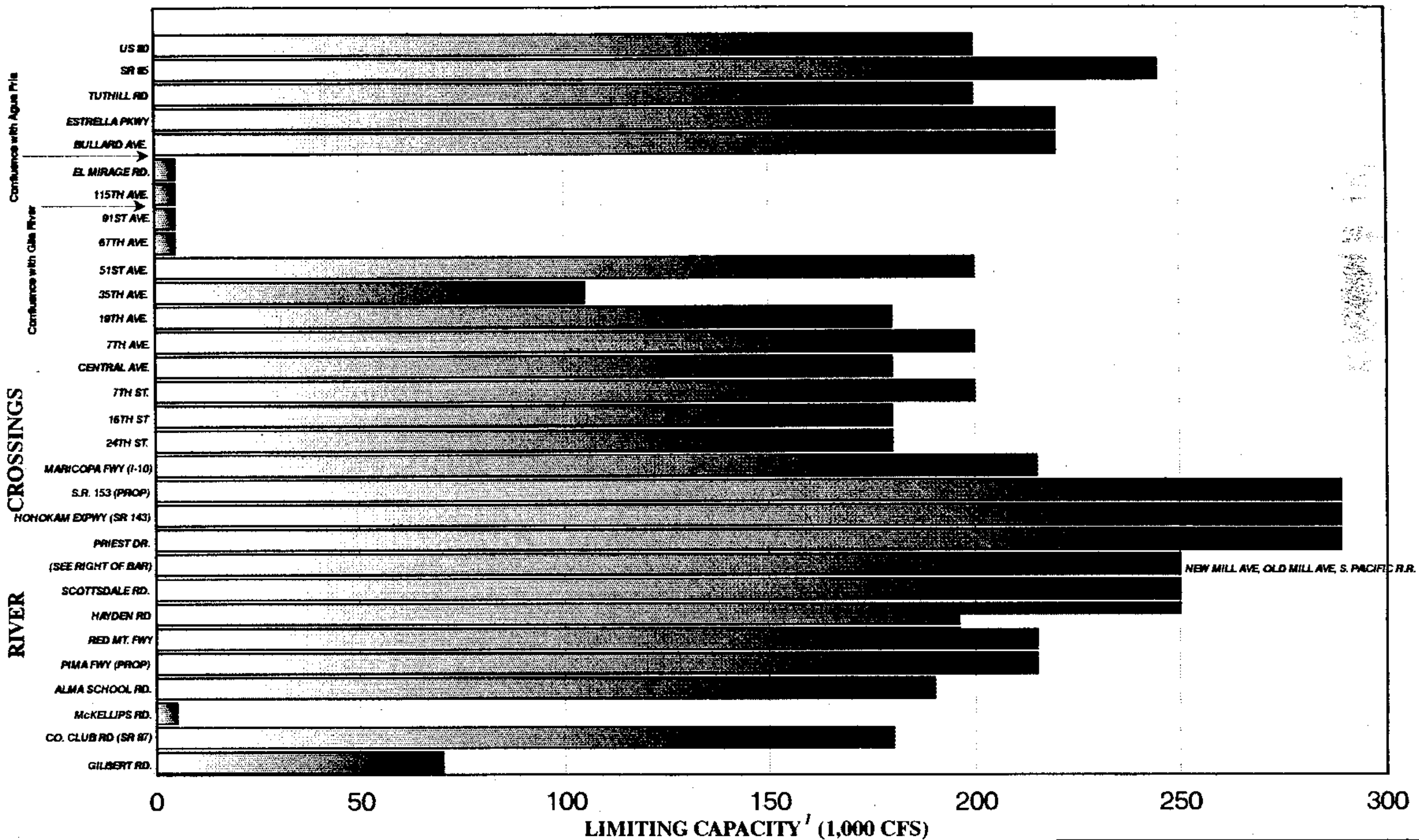
ANNUAL PEAK INFLOW TO MODIFIED ROOSEVELT DAM 1889 - 1993

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

Source: Draft - Section 7 Study for Modified Roosevelt Dam, Arizona
Hydrologic Evaluation of Water Control Plans
Salt River Project to Gila River at Gillespie Dam, June 1995

DRAWN BY:MM
DATE: 7-95

PLATE 9



MODIFIED ROOSEVELT DAM
SALT RIVER, ARIZONA
SECTION 7 STUDY

SALT - GILA RIVER
CROSSINGS AND CAPACITIES
GRANITE REEF DIVERSION DAM
TO GILLESPIE DAM

LOS ANGELES DISTRICT
U.S. ARMY CORPS OF ENGINEERS

NOTE:
1. *Limiting Channel Capacity - maximum capacity before first breakout occurs with in the channel reach. First breakout does not necessarily cause damage to the adjacent flood plain area.*

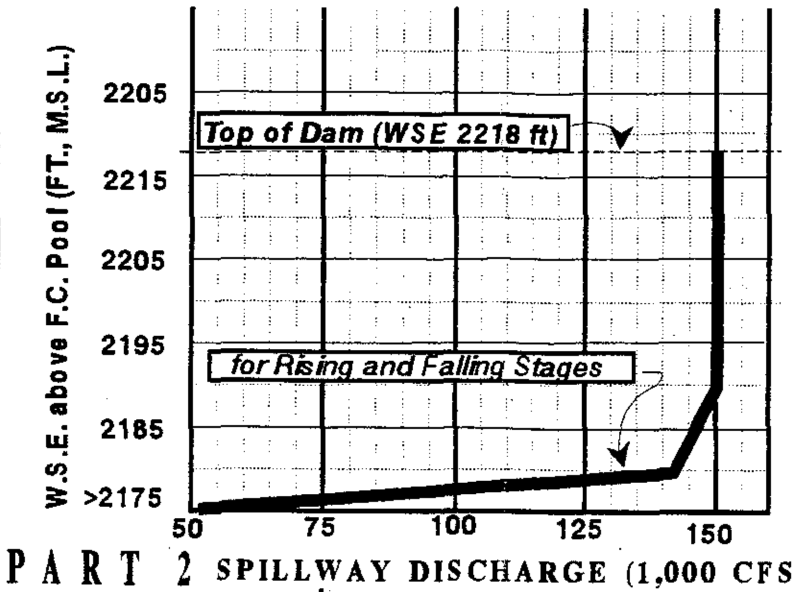
DRAWN BY: MM
DATE: 7-95

SOURCE: Results of Hydraulic Study - Modified Roosevelt Dam - Baker Engineering for Corps of Engineers.

PLATE 10

MODIFIED ROOSEVELT DAM WATER CONTROL DIAGRAM

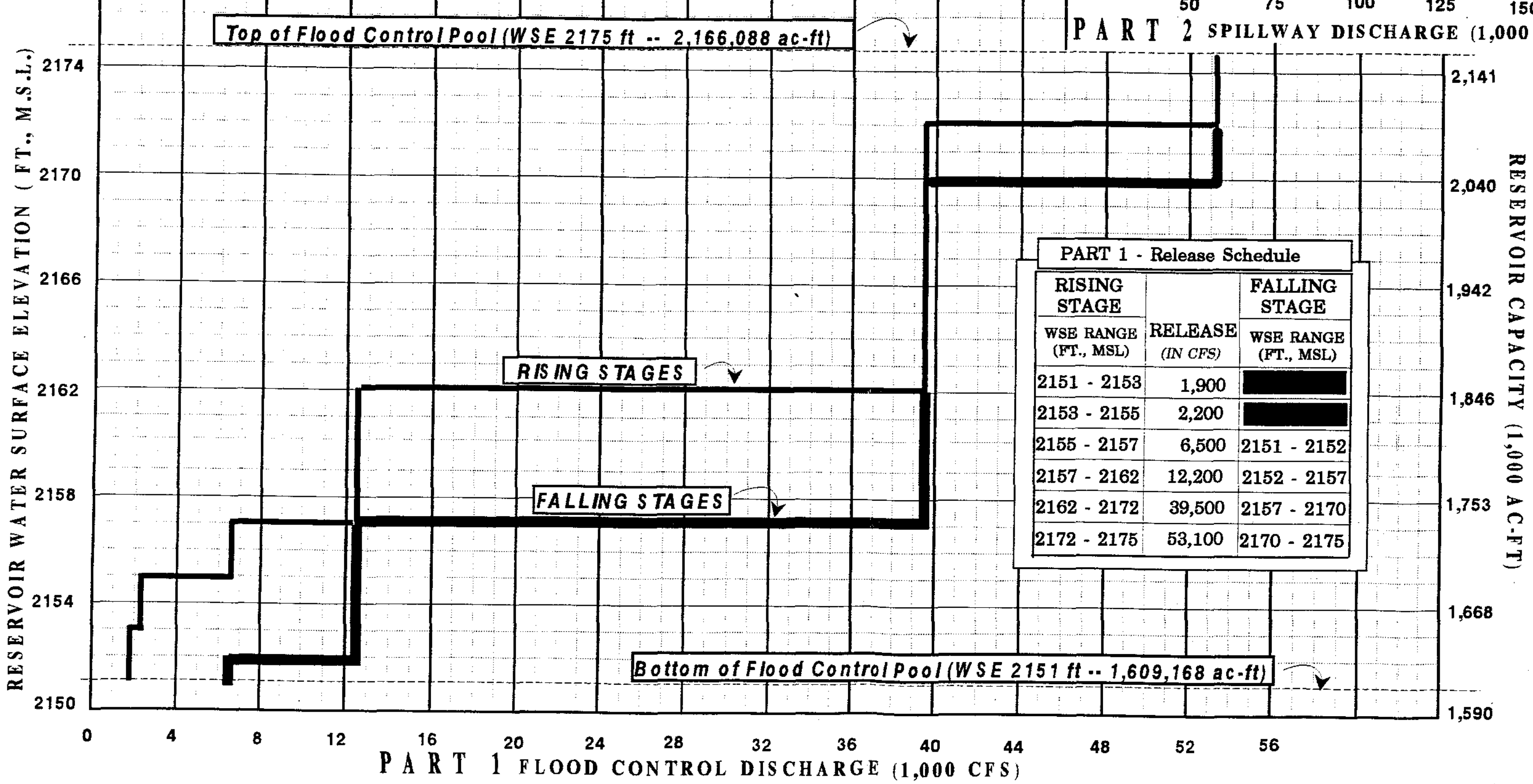
NOTES:
1. Max. discharge within the flood pool (WSE 2151 ft - WSE 2175 ft) is 53,100 cfs .
2. For elevations greater than WSE 2175 ft, follow spillway discharge diagram. When WSE exceeds 2218 ft, maintain spillway flow at 150,000 cfs.
3. Rising and falling stages - refers to trend of WSE, not the inflow hydrograph.
4. When WSE is between 2151 ft - 2175 ft, the combination of Modified Roosevelt Dam outflow and the downstream runoff should not exceed 180,000 cfs at Granite Reef Dam.
5. During rising stages, higher releases can be made provided that d/s constraints are not exceeded.
6. During falling stages, do not reduce to a scheduled discharge if inflow is greater than that discharge value.
7. During transition from rising to falling stage, increase releases if required to meet drawdown duration requirements. Flood pool must be evacuated within 20 days of the beginning of a single design flood (any event with max. pool elevation within the flood pool). In order to accomplish this, in general, the falling stage schedule should be followed.



PART 2 - Release Schedule

RISING AND FALLING STAGE

WSE RANGE (IN FT., MSL))	RELEASE (IN CFS)
2175 - 2176	79,880
2176 - 2177	88,660
2177 - 2178	106.440
2178 - 2179	124,220
2179 - 2180	142,000
2180 - 2181	142,800
2181 - 2182	143,600
2182 - 2183	144,400
2183 - 2184	145,200
2184 - 2185	146,000
2185 - 2186	146,800
2186 - 2187	147,600
2187 - 2188	148,400
2188 - 2189	149,200
2190 - 2218	150,000
>2218	150,000



PART 1 - Release Schedule

RISING STAGE WSE RANGE (FT., MSL)	RELEASE (IN CFS)	FALLING STAGE WSE RANGE (FT., MSL)
2151 - 2153	1,900	
2153 - 2155	2,200	
2155 - 2157	6,500	2151 - 2152
2157 - 2162	12,200	2152 - 2157
2162 - 2172	39,500	2157 - 2170
2172 - 2175	53,100	2170 - 2175

DRAWN BY: MM
DATE 7-95

MODIFIED ROOSEVEL DAM
SALT RIVER, ARIZONA
SECTION 7 STUDY

MODIFIED ROOSEVELT DAM WATER CONTROL DIAGRAM

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

APPENDIX A.

MONTHLY INFLOW TO HORSESHOE AND

MODIFIED ROOSEVELT DAM, 1889-1993

The information in this appendix was developed by the Los Angeles District, United States Army Corps of Engineers from United States Geological Survey streamflow record, and is included as basic data used in this study.

Mean Monthly Inflow to Horseshoe Dam

9/30/93

filename: versum.tab

Sources:

1888-1923: Data compilation sheet, updated to March 1978
1924-1938: USGS Water Supply Papers, Verde River below Bartlett Dam*
1939-1945: USGS Water Supply Papers, Verde River above Bartlett Dam*
1946-1991: USGS Water Supply Papers, Verde River below Tangle Creek*
1992-1993: USGS data, Verde River below Tangle Creek

*Data taken from WSP on CD ROM

All values in cfs

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1888											162	158
1889	157	397	3159	2357	1106	3218	750	186	133	196	192	236
1890	208	272	2682	1974	4287	2367	347	164	144	208	1796	1059
1891	1306	2225	2953	1354	16481	1819	504	432	378	296	262	373
1892	243	242	309	268	181	151	83	86	49	143	187	155
1893	210	242	266	218	634	1128	274	142	64	212	757	500
1894	355	279	297	230	244	500	161	64	75	112	414	275
1895	228	217	417	3808	1592	3509	708	243	144	137	339	166
1896	448	437	369	307	290	267	208	162	110	813	801	525
1897	426	464	332	2017	824	1419	1122	254	142	123	414	936
1898	288	247	252	239	468	603	301	174	131	305	377	319
1899	159	184	286	330	325	245	193	143	143	344	409	337
1900	518	209	205	178	188	151	83	86	49	49	142	114
1901	173	406	211	331	1754	844	175	132	99	198	592	88
1902	126	231	253	213	235	232	208	174	110	81	451	997
1903	136	196	416	236	342	1392	2590	133	128	219	310	484
1904	300	195	214	224	213	174	112	119	59	688	1532	455
1905	177	198	227	1339	7273	8283	4931	785	267	231	535	727
1906	513	3238	825	766	1134	5152	971	233	142	221	701	199
1907	171	294	2491	2292	2471	3554	791	237	197	205	406	381
1908	579	354	305	289	1861	1316	284	418	138	436	830	336
1909	250	265	2952	1660	1376	1914	1187	189	127	358	1184	448
1910	151	208	334	3361	484	1215	792	132	61	118	295	208
1911	183	308	287	2740	2372	2238	406	453	268	419	231	521
1912	642	481	557	283	283	1382	1994	248	216	293	459	191
1913	649	242	232	216	643	1699	1331	108	126	144	208	341
1914	192	320	289	903	2873	676	237	145	108	192	221	217
1915	308	255	615	1171	2309	3388	2057	2512	195	313	329	163
1916	167	234	371	7765	3553	4891	657	219	150	190	479	1223
1917	685	308	321	1153	1411	1660	5665	1182	221	393	686	367
1918	233	229	251	372	853	4352	335	151	129	180	514	179
1919	182	326	432	325	899	1472	1255	163	111	2006	855	444
1920	699	2689	2104	2108	8449	1776	982	288	197	170	430	215
1921	227	437	323	297	316	492	223	158	119	279	1599	346
1922	417	272	1356	2447	2593	3093	1009	242	154	194	314	226
1923	175	267	1159	327	1153	2082	749	182	109	188	240	1820
1924	255	913	3302	938	338	493	1553	162	93	176	99	191
1925	228	212	433	298	329	413	452	204	124	204	354	1128
1926	779	341	368	298	293	720	4423	408	117	193	248	347
1927	246	215	432	320	7080	2029	809	195	202	259	474	1829
1928	279	297	424	480	1421	995	241	169	112	133	482	189
1929	263	275	303	320	412	1368	2140	149	116	164	581	390
1930	175	217	234	291	443	1341	545	175	99	312	624	283
1931	225	514	356	229	3019	639	252	246	97	161	779	376
1932	213	600	948	478	6454	3640	777	199	137	224	247	134
1933	292	208	294	382	364	726	299	344	148	182	164	231
1934	233	206	253	260	269	226	257	120	106	124	452	215
1935	166	267	317	1046	2236	1971	1000	183	114	120	592	485
1936	238	247	278	265	866	969	692	150	93	223	434	318
1937	211	312	291	461	6333	4076	1420	188	142	216	163	187

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1938	205	215	262	272	406	4715	223	128	99	138	290	203
1939	167	205	375	291	336	861	322	124	89	89	309	1391
1940	207	232	253	333	930	386	267	152	133	106	356	321
1941	735	430	2167	1372	3387	4873	4671	665	207	239	268	328
1942	525	392	429	540	371	990	654	246	124	132	173	148
1943	186	230	274	429	640	1757	253	136	103	98	430	197
1944	230	212	308	298	773	2621	1717	347	126	122	140	201
1945	216	275	283	315	546	2150	1735	239	117	150	362	147
1946	228	224	346	303	265	279	787	140	102	183	397	309
1947	193	442	517	370	324	229	174	147	103	119	381	270
1948	201	239	299	260	341	912	830	139	108	147	312	116
1949	168	230	349	966	1190	2687	1642	195	173	185	210	283
1950	550	262	300	308	974	509	188	134	101	310	194	152
1951	155	205	227	249	262	261	207	263	95	94	1184	280
1952	222	280	1730	2255	416	1865	2474	313	108	127	212	270
1953	188	299	327	412	244	315	176	161	101	430	418	182
1954	164	201	241	253	254	1949	625	130	100	299	340	253
1955	198	215	239	285	268	362	179	135	316	332	841	142
1956	183	221	284	250	243	205	186	117	87	205	189	99
1957	158	211	231	1351	2239	589	175	201	175	194	322	136
1958	208	973	269	232	900	2689	1181	156	129	75	254	604
1959	269	244	239	227	378	331	170	133	94	228	546	130
1960	640	315	1367	859	411	1873	246	155	109	90	175	237
1961	224	229	232	224	225	232	412	122	85	133	269	340
1962	161	220	296	336	1711	1250	841	125	92	90	127	179
1963	190	192	246	250	249	223	155	113	83	89	793	405
1964	177	255	244	240	220	315	1059	130	92	155	896	231
1965	156	210	256	1563	941	1491	4328	265	130	163	228	337
1966	166	1384	4613	1048	397	1715	276	167	121	147	317	261
1967	251	264	2805	310	261	230	267	167	164	176	327	230
1968	180	204	988	1200	2433	1230	600	271	144	160	337	154
1969	230	265	286	2383	730	1862	863	200	127	148	210	269
1970	183	269	247	260	236	843	300	166	126	207	309	1463
1971	225	256	278	284	248	260	199	149	108	109	443	173
1972	305	287	1350	384	247	194	180	139	146	160	244	158
1973	4194	1089	1367	587	1614	3894	5638	1322	216	204	217	164
1974	198	268	290	394	261	340	232	159	113	183	196	159
1975	206	375	272	264	283	901	1329	223	127	175	143	189
1976	177	226	274	254	2819	719	1113	274	127	202	167	262
1977	246	249	275	314	258	226	228	168	125	128	245	207
1978	262	212	243	624	2053	10418	646	210	128	120	216	167
1979	196	1369	4644	2153	1505	3793	1865	321	198	168	307	159
1980	210	263	285	2706	11022	2499	1532	342	178	288	212	208
1981	222	260	301	330	304	408	455	175	151	173	246	223
1982	453	289	314	508	2123	4410	619	229	143	136	249	238
1983	219	614	2863	720	2852	4384	2079	485	199	205	294	860
1984	1312	307	1675	468	315	260	247	189	135	267	417	269
1985	269	298	1939	833	1267	2302	742	264	138	213	187	266
1986	268	761	732	293	750	1560	566	157	181	298	255	265
1987	442	301	384	346	782	2177	545	197	136	121	214	179
1988	245	1147	364	592	1489	605	1892	263	147	166	433	310
1989	239	248	285	374	422	437	201	146	116	140	230	130
1990	187	242	284	299	288	441	275	149	106	295	220	311
1991	199	210	258	465	259	3776	1710	161	130	128	155	175
1992	164	253	416	731	1893	3597	883	253	206	180	1114	233
1993[p]	204	246	1194	11610	7956	2499	764	256	175	150	241	262

n/a: not available at the time of this compilation

1993[p]: 1993 data is preliminary USGS data and subject to revision (final data probably unavailable until mid-summer 1994)

Mean Monthly Inflow to Roosevelt Dam — 9/30/93
filename: saltsum.tab

sources:
1888-1904: Data compilation sheet, updated to March 1978
1904-1908: USGS Water Supply Paper, Salt River at Roosevelt
1908-1914: Data compilation sheet, updated to March 1978
1914-1941: USGS Water Supply Papers, Salt River near Roosevelt, Tonto Creek near Roosevelt*
1941-1991: USGS Water Supply Papers, Salt River near Roosevelt, Tonto Creek above Gun Creek**
1992-1993: USGS Data, Salt River near Roosevelt, Tonto Creek above Gun Creek

*January 1914 - December 1940: (Salt + Tonto) * 1.06
**January 1941 - August 1993: (Salt + Tonto) * 1.08

All values in cfs

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1888											161	161
1889	146	379	3014	3092	1303	4897	2862	790	296	257	192	240
1890	194	259	2561	2591	5049	3596	1325	695	322	272	1787	1076
1891	1218	2123	2817	1777	19410	2768	1922	1834	842	388	261	378
1892	227	230	295	352	221	230	315	365	110	189	186	157
1893	196	231	253	286	747	1718	1043	602	143	279	753	508
1894	331	266	283	303	288	760	616	271	166	148	412	280
1895	213	207	397	5390	1373	1738	1711	673	309	160	440	242
1896	857	764	603	447	393	844	941	485	204	779	797	534
1897	398	443	317	2647	970	2160	4281	1114	358	175	410	673
1898	549	273	270	338	587	688	757	448	237	408	385	338
1899	156	202	300	356	386	480	536	308	204	444	671	298
1900	253	203	195	234	221	230	315	365	110	64	142	116
1901	161	387	202	454	2414	1423	1050	735	288	346	529	301
1902	152	195	190	189	207	201	268	167	106	78	478	1057
1903	131	189	441	207	318	600	909	352	285	142	411	316
1904	253	211	208	221	215	217	148	132	80	356	1514	460
1905	281	164	172	1611	8213	15297	12558	4606	1405	529	600	722
1906	342	6395	1684	1474	1432	7770	5083	1694	667	514	869	466
1907	300	275	4952	3259	2549	3709	1938	748	514	428	1300	1131
1908	1322	880	466	388	3753	3677	1578	903	430	780	2066	1082
1909	369	354	3615	1135	3417	2882	3722	513	642	442	1151	2368
1910	458	1063	322	1606	604	1196	997	491	136	155	294	212
1911	170	294	274	2158	2896	4357	1114	564	322	616	348	245
1912	906	395	234	228	233	1898	2258	1139	415	368	548	448
1913	423	288	293	274	559	1348	1859	592	228	231	270	369
1914	230	386	449	577	2087	1261	1172	473	277	658	1163	805
1915	713	561	3129	3067	4808	4477	6492	4204	1365	1584	660	421
1916	344	404	436	19803	5022	9051	4683	1970	911	501	845	1106
1917	1569	501	352	1876	1824	1362	3523	1366	553	575	555	353
1918	260	283	285	339	601	2490	794	406	316	433	504	216
1919	196	299	433	325	1717	2084	4078	1346	408	3711	1951	886
1920	543	2662	5730	3252	11240	3503	2649	1824	704	338	725	337
1921	339	605	375	364	429	455	359	317	241	835	4045	1172
1922	371	276	488	1011	1845	3158	2264	1058	427	401	581	273
1923	206	260	723	328	926	2378	1408	709	268	462	1031	2075
1924	434	1216	4750	1682	612	1145	3566	1206	415	272	284	218
1925	194	213	326	260	265	1184	729	288	218	301	672	1101
1926	529	357	308	272	300	1510	6337	2535	507	369	398	418
1927	293	274	608	393	6439	2707	2461	1450	733	414	556	973
1928	244	243	293	273	985	903	703	554	274	340	483	285
1929	287	325	289	330	447	899	2338	492	228	331	1231	1107
1930	444	285	241	341	623	2116	1859	649	302	703	1075	289
1931	175	433	309	212	3567	939	1569	1159	284	345	1167	1318
1932	1183	974	1706	1069	8402	4109	3496	1309	473	549	939	550
1933	341	251	339	395	695	1838	1273	1142	560	529	503	445
1934	515	316	339	273	321	455	345	215	133	194	862	515
1935	197	253	238	1226	2821	3217	3540	1204	710	247	687	610

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1936	236	268	270	246	2392	2290	3626	1220	381	265	481	551
1937	258	339	395	616	6019	4734	3855	1342	421	339	305	267
1938	217	208	251	232	281	2772	910	475	212	248	681	471
1939	165	173	277	273	522	1599	2109	556	167	138	420	321
1940	203	238	220	276	698	986	1004	468	244	241	391	478
1941	565	539	4159	4399	4097	10740	6300	5978	1529	766	705	644
1942	806	562	898	1349	741	1529	2583	1062	331	240	455	338
1943	296	284	406	1253	1146	3515	1841	675	234	180	451	370
1944	279	235	248	251	716	1913	1670	779	288	211	287	414
1945	315	293	299	359	707	2445	3004	1308	300	227	612	218
1946	294	196	319	320	287	555	649	265	119	192	736	2157
1947	344	669	809	455	532	667	544	377	139	113	529	751
1948	775	300	411	320	445	1281	3486	886	229	234	324	131
1949	148	200	629	2760	1574	2948	3129	1376	519	602	681	275
1950	260	226	264	274	518	709	642	259	129	276	241	196
1951	128	151	176	205	235	303	381	444	132	123	2327	334
1952	185	262	1581	8124	874	3382	6211	2584	756	305	533	268
1953	178	340	370	376	272	1620	690	401	226	363	287	114
1954	111	162	177	197	217	2832	1131	410	144	429	763	340
1955	158	157	172	207	204	278	243	174	242	466	2375	301
1956	159	181	263	271	503	839	723	411	131	164	218	85
1957	100	141	148	1882	1489	952	706	570	358	215	1208	386
1958	292	497	288	219	971	4244	4545	2008	451	163	358	766
1959	791	271	243	215	263	281	280	144	86	274	1704	260
1960	1000	1578	3989	3861	1318	3767	1858	764	320	149	203	160
1961	281	228	209	214	224	406	623	220	121	153	347	354
1962	162	306	669	1349	2610	2351	4471	1307	343	209	173	267
1963	291	272	253	293	1488	879	994	331	114	85	1820	1085
1964	373	362	238	195	197	290	1134	417	154	350	774	920
1965	328	218	253	2653	1828	2396	4373	1680	616	445	583	274
1966	180	694	9345	2235	880	3649	2771	972	299	225	526	661
1967	274	260	754	261	271	350	359	199	145	450	1512	764
1968	237	222	2047	2982	4131	3531	3187	1507	513	344	845	261
1969	264	244	272	2064	1016	1668	2690	1157	351	255	404	557
1970	264	349	304	273	267	779	1047	741	225	207	398	1572
1971	297	206	226	263	268	312	295	204	111	136	1072	604
1972	2596	839	1853	756	381	546	288	168	225	168	202	240
1973	6247	1801	2272	1290	3991	7777	7457	6715	1483	639	435	229
1974	210	267	272	538	296	685	591	327	132	208	351	190
1975	645	605	265	260	577	2594	3630	1937	528	381	203	376
1976	170	193	269	223	2261	725	1497	995	271	343	328	310
1977	228	209	199	275	260	281	719	362	156	246	461	361
1978	267	224	186	660	3086	15709	3525	1163	360	228	408	208
1979	219	2629	8025	5630	4340	7236	7356	3306	1431	458	479	258
1980	237	318	303	3140	14322	3929	4490	3104	992	447	621	374
1981	356	430	353	298	334	929	1461	650	229	318	426	313
1982	607	312	308	951	2267	3995	2271	1364	438	240	506	538
1983	232	726	3408	1709	4432	7308	5072	3622	1327	513	674	830
1984	5701	604	2795	1149	675	917	1028	641	219	381	841	799
1985	1421	726	6224	3238	3167	6191	3812	2376	722	371	519	542
1986	621	1039	752	418	1839	3406	1918	680	305	448	474	398
1987	584	1054	1237	534	1231	3312	3434	1475	443	243	625	245
1988	278	924	377	1128	2329	1284	2213	1357	361	358	1715	1619
1989	355	285	292	434	816	1360	667	266	132	161	391	161
1990	206	213	219	241	267	515	492	281	124	536	526	312
1991	266	327	1305	2205	813	9370	4436	1788	620	243	339	491
1992	219	325	964	1320	3023	3977	3615	1615	920	336	2065	524
1993P	274	289	2771	19161	10538	6223	5459	2543	802	342	454	524

n/a: not available at the time of this compilation
1993P: 1993 data is preliminary USGS data and subject to revision (final data probably unavailable until mid-summer 1994)

<u>APPENDIX B.</u>

MAXIMUM COINCIDENT DURATION INFLOW TO HORSESHOE AND MODIFIED ROOSEVELT DAM, 1889-1993

The information in this appendix was developed by the Los Angeles District, United States Army Corps of Engineers from United States Geological Survey streamflow record, and is included as basic data used in this study.

INFLOW TO ROOSEVELT DAM[1], FT^3/S - SALT R. COINCIDENT WITH VERDE R.

WY	PEAK	1-DAY	2-DAY	3-DAY	5-DAY	10-DAY	30-DAY	60-DAY	90-DAY
1889	27500	19570	16500	13800	10800	7500	4900	3880	3100
1890	105000	71600	40000	29000	22000	14000	5050	4320	3750
1891	194340	105000	96000	75000	50000	31000	19410	11090	8000
1892	8000	760	650	560	540	510	300	320	290
1893	29000	20700	17500	14500	11300	7900	1720	1230	1170
1894	1900	1430	1230	1050	970	860	760	690	560
1895	70000	49800	42000	35000	25500	16500	5390	3380	2830
1896	18000	7190	6100	5200	4300	3250	780	790	700
1897	27000	19420	16500	13700	10700	7500	4280	3220	2520
1898	10800	1210	1030	900	830	750	690	720	680
1899	13000	3330	2800	2400	2100	1700	670	560	470
1900	5000	360	310	260	230	180	250	230	220
1901	5500	4170	3550	3000	2600	2100	2410	1920	1630
1902	14900	4500	3800	3250	2750	2200	1060	770	540
1903	2700	2050	1750	1500	1400	1200	910	760	610
1904	27000	14700	8950	6470	4260	3150	1510	940	780
1905	68000	45470	44410	36400	28650	26980	15300	13930	12020
1906	145000	97710	71480	52340	35040	19140	7770	6430	4760
1907	50100	36600	23830	18240	13100	7540	4950	4110	3590
1908	46000	29050	22450	31830	20320	11190	3750	3720	3000
1909	46000	10660	21840	20400	15190	9630	3620	3300	3340
1910	-1	-1	-1	-1	-1	-1	1610	1110	1140
1911	-1	-1	-1	-1	-1	-1	4360	3630	3140
1912	-1	-1	-1	-1	-1	-1	2260	7080	1770
1913	-1	-1	-1	-1	-1	-1	1860	1600	1260
1914	15940	11230	9660	8510	7640	6560	2090	1670	1310
1915	73780	51420	36980	28580	20430	13140	6490	5490	5260
1916	128870	113490	101030	89750	69600	39790	19800	12410	11290
1917	42590	27260	15070	12640	9460	6340	3520	2440	2240
1918	12590	1420	4350	4670	3370	3770	2490	1550	1300
1919	26350	13720	13170	11350	10200	8190	3710	3080	2630
1920	102000	70410	62140	52420	38850	23060	11240	7250	6740
1921	27570	14580	12380	9900	8710	5980	4050	2610	2020
1922	24140	15670	15150	13110	10350	7210	3160	2500	2010
1923	24550	6990	10500	8760	6820	5040	2380	1890	1570
1924	75000	53550	41250	33750	27170	16560	4750	3220	2550
1925	6000	1950	1850	2670	2530	1510	1100	890	690
1926	44650	31090	26650	21580	17090	11300	6340	4440	3460
1927	61000	42930	42430	38550	27510	16350	6440	4570	3870
1928	4500	3300	2730	2730	2180	1770	990	940	860
1929	17530	14860	13500	11560	8460	5790	2340	1620	1230
1930	13730	10890	9190	7930	6100	4500	2120	1990	1530
1931	35860	28360	22250	20080	15330	9150	3570	2250	2030
1932	69770	46220	45210	38190	27890	18410	8400	6260	5340
1933	5370	3600	2350	2360	2150	2040	1840	1560	1420
1934	6450	1480	1870	1880	1710	1590	860	690	520
1935	17000	12690	10550	9540	7400	5300	2820	3020	3190
1936	17090	14390	10980	9250	7040	4810	3630	2960	2770

[1] Inflow to Modified Roosevelt Dam computed for entire 5830 sq.mi. drainage area, including Tonto Creek and the remaining ungaged watershed.

1937	112100	41690	46850	34200	24250	12950	6020	5380	4870
1938	40790	23800	15680	13340	8840	5620	2770	1840	1390
1939	8000	530	870	900	4530	3650	2110	1850	1420
1940	1500	3830	2890	2380	1970	1330	700	840	900
1941	144180	82840	76520	59550	40510	23870	10740	8520	7050
1942	6210	4330	4340	4200	3970	3460	2580	2060	1730
1943	29050	20250	17270	14420	10370	6840	3520	2680	2170
1944	3900	2920	3070	2620	2770	2280	1910	1790	1430
1945	6200	4310	3990	3470	3150	4040	3000	2730	2250
1946	20240	17760	13400	12190	8680	5110	2160	1450	1030
1947	6200	5720	4100	3280	2400	1520	810	740	640
1948	6570	5670	5570	5330	5030	4800	3490	2380	1880
1949	27420	15120	13710	11180	8020	5450	2950	3040	2550
1950	1000	460	490	480	630	610	520	610	620
1951	51300	32620	26440	20260	13250	7000	2330	1330	930
1952	142780	63180	59250	44630	29410	20750	8120	4800	4060
1953	400	5300	4890	4580	3720	2710	1620	1160	900
1954	47820	27380	23020	18950	13930	8520	2830	1980	1460
1955	17400	7410	6150	5840	4730	3770	2380	1420	1030
1956	6000	1300	1300	1280	1260	1170	840	780	690
1957	19070	7720	8960	9380	6620	3880	1490	1690	1440
1958	30620	19500	14140	12360	9520	7870	4240	4400	3600
1959	16830	8480	8180	6780	5130	3520	1700	990	750
1960	95200	55890	46410	33960	21640	11670	3770	3930	2980
1961	14280	670	660	690	710	800	620	520	420
1962	9000	5000	4670	4540	4300	3800	4470	3410	3140
1963	43110	12790	8680	6500	4560	3330	1820	1450	1000
1964	13900	1190	980	1250	1290	1120	1130	850	680
1965	24970	19900	16300	13970	10110	6060	4370	3390	2870
1966	88000	60480	45850	35520	23700	20460	9350	5790	4090
1967	11190	6870	4800	3660	2770	1710	750	510	430
1968	25660	21430	17800	14980	11640	7370	4130	3830	3550
1969	16780	10610	10170	8780	6790	5070	2060	2180	1580
1970	57690	15470	13950	10680	7210	4040	1570	990	730
1971	13870	3730	2710	2710	2170	1930	1070	840	600
1972	34230	21910	14860	10970	8130	4980	1850	1310	1760
1973	83760	73010	54030	43000	28100	15420	7460	7620	7320
1974	4710	1720	1370	1310	1220	1040	690	640	530
1975	13340	3830	3990	3980	4250	4360	3630	3100	2710
1976	40200	14030	14210	11460	7940	5200	2260	1490	1490
1977	11030	2090	1590	1470	1320	1080	720	540	450
1978	155000	120150	102060	93350	64710	38290	15710	9400	7440
1979	152300	77610	80710	61670	40890	22250	8030	6830	6000
1980	142130	100120	77710	57460	42270	35510	14320	9130	7580
1981	5130	1300	1340	1290	1280	1920	1460	1200	1010
1982	23650	3420	8260	9510	10390	7830	4000	3130	2840
1983	35910	16060	11630	10390	8030	11440	7310	5870	5600
1984	67100	55650	46260	40280	27830	15670	5700	3150	3030
1985	58150	47350	35830	30390	22040	12840	6190	4680	4390
1986	16710	9040	9790	9010	6990	5320	3410	2620	2390
1987	10150	7710	6280	4290	4760	3970	3310	3370	2660
1988	30880	15410	12240	9740	7090	5160	2210	1750	1940
1989	8030	3590	2960	2360	2070	1870	1360	1090	950
1990	7260	2960	2490	2190	1670	1050	520	530	460
1991	106380	63500	62100	46810	30840	18130	9370	6900	5200
1992	29510	12640	15390	13150	9710	6070	3980	3500	3540
1993	194000	133270	90490	69760	54240	36230	19230	15310	12220

INFLOW TO HORSESHOE DAM, FT^3/S - VERDE R. COINCIDENT WITH SALT R.

WY	PEAK	1-DAY	2-DAY	3-DAY	5-DAY	10-DAY	30-DAY	60-DAY	90-DAY
1889	31000	20470	16200	13000	9700	6500	3220	1980	2230
1890	94000	60850	48000	37300	26500	17000	4290	3330	2880
1891	141510	127360	100000	75000	52000	31500	16480	9150	6930
1892	1000	600	500	400	300	250	310	290	270
1893	20000	13590	10700	8800	6600	4550	1130	880	680
1894	1220	870	690	650	520	430	500	330	300
1895	47000	31320	24300	19800	14200	9300	3810	2700	2970
1896	12600	3910	3200	2700	2200	1600	810	810	710
1897	24000	14810	11050	9700	7200	4900	1120	1270	930
1898	7200	1730	1300	1250	1000	780	600	450	460
1899	8200	2170	1750	1600	1200	940	410	380	360
1900	11500	3560	2800	2500	1930	1450	520	360	310
1901	9000	6240	4900	4200	3250	2350	1750	1300	920
1902	14000	4680	3600	3300	2400	1900	1000	720	510
1903	29000	18870	14800	12000	8900	6100	2590	1990	1440
1904	13000	1680	2960	2250	2440	2190	1530	1110	890
1905	46000	23200	26750	22610	17360	13920	8280	6610	6830
1906	96000	57980	35180	25190	16540	9040	5150	3060	2420
1907	24000	14620	11460	8710	7220	7250	2490	2390	2420
1908	20000	13590	11420	8680	5860	3450	1860	1590	1150
1909	75000	46680	32360	23330	15060	8080	2950	1550	1490
1910	-1	-1	-1	-1	-1	-1	3360	1920	1690
1911	-1	-1	-1	-1	-1	-1	2240	2310	2450
1912	-1	-1	-1	-1	-1	-1	1990	1690	1220
1913	-1	-1	-1	-1	-1	-1	1330	1520	1220
1914	24000	16160	14770	12950	11010	6940	2870	1780	1480
1915	21500	14790	13530	10630	7050	4620	2060	2720	2590
1916	69000	50330	38400	39690	26630	14080	7770	5660	5400
1917	21000	14340	24100	18880	14620	12730	5670	3660	2910
1918	42000	22930	21930	17390	13370	10970	4350	2600	1850
1919	18600	4720	4890	5080	5830	4410	2010	1360	1210
1920	68000	45190	45330	37200	27700	15790	8450	5280	4220
1921	17100	6230	5160	4130	3060	2110	1600	970	740
1922	26000	16790	12650	11310	9110	6690	3090	2840	2710
1923	44000	23870	12170	8290	7280	3920	2080	1420	1330
1924	58000	38490	31090	24970	18850	10840	3300	2120	1720
1925	20000	11000	6290	6260	4870	2750	1130	740	560
1926	42000	27500	25700	20310	17030	10680	4420	2420	1850
1927	70000	48300	45820	40780	30070	17630	7080	4560	3310
1928	14000	8020	7260	6000	4560	2890	1420	1210	890
1929	26000	16800	14800	13130	9270	5520	2140	1750	1310
1930	2400	1720	2140	1970	2350	2880	1340	940	780
1931	34000	22600	16900	16130	10900	6640	3020	1830	1300
1932	53000	41500	39750	32400	22780	13670	6450	5050	3620
1933	520	490	1480	1410	1340	1060	730	510	460
1934	2400	1320	880	780	700	720	450	330	260
1935	14300	8880	7550	7210	5270	4160	2240	2100	1740
1936	2200	1480	940	1120	1030	800	690	830	840
1937	63000	39200	33150	26100	17450	13260	6330	5210	3940
1938	100000	59700	29850	29330	21360	12260	4720	2470	1690
1939	17700	9030	6660	5680	600	470	320	590	440
1940	5020	3520	2820	2780	2320	1560	930	660	530
1941	45000	21200	25700	21300	14750	9390	4870	4770	4310

1942	720	1030	1630	1430	1280	980	650	820	630
1943	13100	7440	8270	7470	5500	4140	1760	1010	880
1944	7530	6140	5630	4870	4360	3640	2620	2170	1700
1945	9710	7620	6640	5660	4130	1990	1740	1940	1380
1946	6200	1380	1070	1200	870	560	310	350	300
1947	11500	4200	3070	2400	1660	1080	520	480	440
1948	1700	1220	1210	1080	890	790	830	870	630
1949	11000	4180	5000	3920	2720	1670	2690	2170	1840
1950	9330	3930	3770	2880	2070	1440	970	740	560
1951	8290	5270	8290	9120	6610	3590	1180	730	520
1952	27800	11600	13500	11230	7820	4290	2260	2170	1550
1953	6390	350	350	390	450	400	320	250	220
1954	19700	13000	12000	9980	7310	5790	1950	1290	900
1955	11600	2640	2880	2340	1850	1970	840	590	500
1956	12800	180	190	190	190	190	210	200	210
1957	14500	9070	8020	6050	4270	2450	2240	1800	1390
1958	21100	17300	11790	9840	7040	6180	2690	1940	1340
1959	5000	1060	1020	890	750	660	550	390	300
1960	23400	11900	12300	9220	6050	3350	1870	1110	1050
1961	2500	1670	1660	1570	1300	910	410	320	290
1962	13300	7190	7160	5970	4640	3440	840	1050	1270
1963	840	6440	4300	3230	2530	1830	790	600	430
1964	320	2970	2960	2820	2530	1780	1060	560	430
1965	25700	11300	14300	10680	7230	4040	4330	2910	2250
1966	28500	19000	15700	12760	8900	9090	4610	2830	2350
1967	53000	45000	31600	22580	14720	7860	2810	1560	1130
1968	32600	10200	7590	6200	4640	3070	2430	1830	1620
1969	45800	26200	19800	15970	10670	6600	2380	1360	1660
1970	48000	26600	16010	11680	7430	3940	1460	890	660
1971	370	230	370	480	460	470	440	310	240
1972	21100	14300	9130	8770	6000	3580	1350	870	650
1973	63400	45100	34550	27570	18140	10250	5640	4770	3620
1974	370	940	770	540	510	440	340	290	240
1975	2900	4360	4030	3850	3450	2500	1330	1120	820
1976	38000	24800	19600	15290	10310	6880	2820	1770	1550
1977	170	170	270	260	270	250	230	200	210
1978	91400	64700	64900	61500	43060	26350	10420	6240	4370
1979	123000	91000	75700	55530	35680	18600	4640	3400	2770
1980	94800	59200	43400	33500	27820	26040	11020	6760	5020
1981	1200	1560	1470	1440	1160	280	460	430	350
1982	42100	20700	18450	15340	12480	8550	4410	3270	2380
1983	22300	15240	13200	11630	9070	3280	4380	3620	3110
1984	27200	5810	11010	8250	5430	3300	1310	810	1100
1985	19300	16600	14750	10440	8060	4650	2300	1790	1350
1986	270	2620	3070	3100	2760	3100	1560	1160	960
1987	5000	3570	2700	4380	4230	3430	2180	1360	1170
1988	19800	9460	7490	5830	4020	1100	1890	1250	1330
1989	2670	730	1020	860	390	400	440	430	350
1990	1900	280	180	160	410	320	440	260	280
1991	34300	19600	19500	15730	11080	7330	3780	2740	1880
1992	16300	12600	8460	7320	5660	5960	3600	2750	2120
1993	127000	99100	68550	50730	35220	23190	11610	9780	7360

APPENDIX C.

AREA-CAPACITY TABLE FOR MODIFIED

ROOSEVELT DAM

The information in this appendix has been provided by the United States Bureau of Reclamation at the request of the Los Angeles District, United States Army Corps of Engineers, and is included as basic data used in this study.

THEODORE ROOSEVELT LAKE - SALT RIVER PROJECT

1981 AREA - CAPACITY TABLES

COMPUTED
01/05/82
10.12.30.

AREA TABLE IN ACRES

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1966	5	14	24	33	42	52	61	71	80	90
1967	99	108	118	127	137	146	156	165	175	184
1968	193	203	212	222	231	241	250	259	269	278
1969	288	297	307	316	325	335	344	354	363	373
1970	382	391	401	410	420	429	439	448	458	467
1971	478	486	495	505	514	524	533	542	552	561
1972	568	572	576	581	585	589	593	597	602	606
1973	610	614	618	623	627	631	635	639	644	648
1974	652	656	660	664	669	673	677	681	685	690
1975	694	698	702	706	711	715	719	723	727	732
1976	736	740	744	748	752	757	761	765	769	773
1977	778	782	786	790	794	799	803	807	811	815
1978	819	824	828	832	836	840	845	849	853	857
1979	861	866	870	874	878	882	887	891	895	899
1980	903	907	912	916	920	924	928	933	937	941
1981	945	949	954	958	962	966	970	975	979	983
1982	987	991	995	999	1003	1007	1011	1015	1019	1023
1983	1027	1031	1034	1038	1042	1046	1050	1054	1058	1062
1984	1066	1070	1074	1078	1082	1086	1090	1094	1098	1102
1985	1106	1110	1114	1118	1122	1126	1130	1133	1137	1141
1986	1145	1149	1153	1157	1161	1165	1169	1173	1177	1181
1987	1185	1189	1193	1197	1201	1205	1209	1213	1217	1221
1988	1225	1229	1233	1236	1240	1244	1248	1252	1256	1260
1989	1264	1268	1272	1276	1280	1284	1288	1292	1296	1300
1990	1304	1308	1312	1316	1320	1324	1328	1332	1335	1339
1991	1343	1347	1351	1355	1359	1363	1367	1371	1375	1379
1992	1385	1393	1401	1409	1418	1426	1434	1442	1450	1458
1993	1466	1475	1483	1491	1499	1507	1515	1523	1532	1540
1994	1548	1556	1564	1572	1580	1589	1597	1605	1613	1621
1995	1629	1637	1646	1654	1662	1670	1678	1686	1694	1703
1996	1711	1719	1727	1735	1743	1751	1760	1768	1776	1784
1997	1792	1800	1808	1816	1825	1833	1841	1849	1857	1865
1998	1873	1882	1890	1898	1906	1914	1922	1930	1939	1947
1999	1955	1963	1971	1979	1987	1996	2004	2012	2020	2028
2000	2036	2044	2053	2061	2069	2077	2085	2093	2101	2110
2001	2118	2126	2134	2142	2150	2158	2167	2175	2183	2191
2002	2202	2217	2232	2247	2262	2276	2291	2306	2321	2336
2003	2351	2365	2380	2395	2410	2425	2439	2454	2469	2484
2004	2499	2513	2528	2543	2558	2573	2587	2602	2617	2632
2005	2647	2662	2676	2691	2706	2721	2736	2750	2765	2780

THEODORE ROOSEVELT LAKE - SALT RIVER PROJECT

1981 AREA - CAPACITY TABLES

COMPUTED
01/05/82
10.12.30.

AREA TABLE IN ACRES — ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2006	2795	2810	2824	2839	2854	2869	2884	2898	2913	2928
2007	2943	2958	2973	2987	3002	3017	3032	3047	3061	3076
2008	3091	3106	3121	3135	3150	3165	3180	3195	3209	3224
2009	3239	3254	3269	3284	3298	3313	3328	3343	3358	3372
2010	3387	3402	3417	3432	3446	3461	3476	3491	3506	3520
2011	3535	3550	3565	3580	3595	3609	3624	3639	3654	3669
2012	3679	3686	3693	3699	3706	3713	3719	3726	3733	3739
2013	3746	3753	3759	3766	3773	3779	3786	3793	3799	3806
2014	3813	3819	3826	3833	3839	3846	3852	3859	3866	3872
2015	3879	3886	3892	3899	3906	3912	3919	3926	3932	3939
2016	3946	3952	3959	3966	3972	3979	3986	3992	3999	4006
2017	4012	4019	4026	4032	4039	4046	4052	4059	4066	4072
2018	4079	4086	4092	4099	4106	4112	4119	4126	4132	4139
2019	4146	4152	4159	4166	4172	4179	4185	4192	4199	4205
2020	4212	4219	4225	4232	4239	4245	4252	4259	4265	4272
2021	4279	4285	4292	4299	4305	4312	4319	4325	4332	4339
2022	4345	4351	4358	4364	4370	4376	4383	4389	4395	4402
2023	4408	4414	4420	4427	4433	4439	4445	4452	4458	4464
2024	4471	4477	4483	4489	4496	4502	4508	4514	4521	4527
2025	4533	4540	4546	4552	4558	4565	4571	4577	4583	4590
2026	4596	4602	4608	4615	4621	4627	4634	4640	4646	4652
2027	4659	4665	4671	4677	4684	4690	4696	4703	4709	4715
2028	4721	4728	4734	4740	4746	4753	4759	4765	4771	4778
2029	4784	4790	4797	4803	4809	4815	4822	4828	4834	4840
2030	4847	4853	4859	4866	4872	4878	4884	4891	4897	4903
2031	4909	4916	4922	4928	4935	4941	4947	4953	4960	4966
2032	4973	4980	4988	4995	5003	5010	5017	5025	5032	5040
2033	5047	5055	5062	5070	5077	5084	5092	5099	5107	5114
2034	5122	5129	5137	5144	5152	5159	5166	5174	5181	5189
2035	5196	5204	5211	5219	5226	5233	5241	5248	5256	5263
2036	5271	5278	5286	5293	5301	5308	5315	5323	5330	5338
2037	5345	5353	5360	5368	5375	5382	5390	5397	5405	5412
2038	5420	5427	5435	5442	5450	5457	5464	5472	5479	5487
2039	5494	5502	5509	5517	5524	5531	5539	5546	5554	5561
2040	5569	5576	5584	5591	5599	5606	5613	5621	5628	5636
2041	5643	5651	5658	5666	5673	5680	5688	5695	5703	5710
2042	5721	5734	5747	5760	5774	5787	5800	5813	5827	5840
2043	5853	5866	5880	5893	5906	5919	5933	5946	5959	5972
2044	5986	5999	6012	6025	6039	6052	6065	6078	6092	6105
2045	6118	6131	6145	6158	6171	6184	6198	6211	6224	6237

THEODORE ROOSEVELT LAKE - SALT RIVER PROJECT

1981 AREA - CAPACITY TABLES

COMPUTED
01/05/82
10.12.30.

AREA TABLE IN ACRES

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2046	6251	6264	6277	6290	6304	6317	6330	6343	6357	6370
2047	6383	6396	6410	6423	6436	6449	6463	6476	6489	6502
2048	6516	6529	6542	6555	6569	6582	6595	6608	6622	6635
2049	6648	6661	6675	6688	6701	6714	6728	6741	6754	6767
2050	6781	6794	6807	6820	6834	6847	6860	6873	6887	6900
2051	6913	6926	6940	6953	6966	6979	6993	7006	7019	7032
2052	7046	7061	7076	7091	7106	7120	7135	7150	7165	7180
2053	7194	7209	7224	7239	7253	7268	7283	7298	7313	7327
2054	7342	7357	7372	7387	7401	7416	7431	7446	7461	7475
2055	7490	7505	7520	7534	7549	7564	7579	7594	7608	7623
2056	7638	7653	7668	7682	7697	7712	7727	7742	7756	7771
2057	7786	7801	7815	7830	7845	7860	7875	7889	7904	7919
2058	7934	7949	7963	7978	7993	8008	8023	8037	8052	8067
2059	8082	8096	8111	8126	8141	8156	8170	8185	8200	8215
2060	8230	8244	8259	8274	8289	8304	8318	8333	8348	8363
2061	8377	8392	8407	8422	8437	8451	8466	8481	8496	8511
2062	8526	8543	8559	8576	8592	8608	8625	8641	8658	8674
2063	8691	8707	8724	8740	8757	8773	8789	8806	8822	8839
2064	8855	8872	8888	8905	8921	8937	8954	8970	8987	9003
2065	9020	9036	9053	9069	9086	9102	9118	9135	9151	9168
2066	9184	9201	9217	9234	9250	9266	9283	9299	9316	9332
2067	9349	9365	9382	9398	9415	9431	9447	9464	9480	9497
2068	9513	9530	9546	9563	9579	9595	9612	9628	9645	9661
2069	9678	9694	9711	9727	9744	9760	9776	9793	9809	9826
2070	9842	9859	9875	9892	9908	9924	9941	9957	9974	9990
2071	10007	10023	10040	10056	10073	10089	10105	10122	10138	10155
2072	10170	10185	10199	10214	10228	10243	10257	10272	10286	10301
2073	10315	10330	10344	10359	10373	10388	10402	10417	10431	10446
2074	10460	10475	10489	10504	10518	10533	10548	10562	10577	10591
2075	10606	10620	10635	10649	10664	10678	10693	10707	10722	10736
2076	10751	10765	10780	10794	10809	10823	10838	10852	10867	10881
2077	10896	10910	10925	10939	10954	10968	10983	10997	11012	11026
2078	11041	11055	11070	11084	11099	11113	11128	11142	11157	11171
2079	11186	11200	11215	11229	11244	11259	11273	11288	11302	11317
2080	11331	11346	11360	11375	11389	11404	11418	11433	11447	11462
2081	11476	11491	11505	11520	11534	11549	11563	11578	11592	11607
2082	11621	11635	11649	11663	11677	11691	11705	11719	11734	11748
2083	11762	11776	11790	11804	11818	11832	11846	11860	11874	11888
2084	11902	11916	11930	11944	11958	11973	11987	12001	12015	12029
2085	12043	12057	12071	12085	12099	12113	12127	12141	12155	12169

THEODORE ROOSEVELT LAKE - SALT RIVER PROJECT

COMPUTED
01/05/82
10.12.30.

1981 AREA - CAPACITY TABLES

AREA TABLE IN ACRES — ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2086	12183	12197	12212	12226	12240	12254	12268	12282	12296	12310
2087	12324	12338	12352	12366	12380	12394	12408	12422	12437	12451
2088	12465	12479	12493	12507	12521	12535	12549	12563	12577	12591
2089	12605	12619	12633	12647	12661	12676	12690	12704	12718	12732
2090	12746	12760	12774	12788	12802	12816	12830	12844	12858	12872
2091	12886	12900	12915	12929	12943	12957	12971	12985	12999	13013
2092	13023	13030	13037	13043	13050	13057	13063	13070	13076	13083
2093	13090	13096	13103	13110	13116	13123	13130	13136	13143	13149
2094	13156	13163	13169	13176	13183	13189	13196	13203	13209	13216
2095	13223	13229	13236	13242	13249	13256	13262	13269	13276	13282
2096	13289	13296	13302	13309	13316	13322	13329	13335	13342	13349
2097	13355	13362	13369	13375	13382	13389	13395	13402	13408	13415
2098	13422	13428	13435	13442	13448	13455	13462	13468	13475	13481
2099	13488	13495	13501	13508	13515	13521	13528	13535	13541	13548
2100	13555	13561	13568	13574	13581	13588	13594	13601	13608	13614
2101	13621	13628	13634	13641	13647	13654	13661	13667	13674	13681
2102	13689	13698	13707	13717	13726	13736	13745	13754	13764	13773
2103	13783	13792	13801	13811	13820	13830	13839	13848	13858	13867
2104	13877	13886	13895	13905	13914	13924	13933	13942	13952	13961
2105	13971	13980	13989	13999	14008	14018	14027	14036	14046	14055
2106	14065	14074	14083	14093	14102	14112	14121	14130	14140	14149
2107	14159	14168	14177	14187	14196	14206	14215	14225	14234	14243
2108	14253	14262	14272	14281	14290	14300	14309	14319	14328	14337
2109	14347	14356	14366	14375	14384	14394	14403	14413	14422	14431
2110	14441	14450	14460	14469	14478	14488	14497	14507	14516	14525
2111	14535	14544	14554	14563	14572	14582	14591	14601	14610	14619
2112	14630	14643	14655	14667	14680	14692	14704	14717	14729	14741
2113	14754	14766	14778	14791	14803	14815	14828	14840	14852	14865
2114	14877	14889	14902	14914	14926	14939	14951	14963	14976	14988
2115	15000	15013	15025	15037	15050	15062	15074	15087	15099	15111
2116	15124	15136	15148	15161	15173	15185	15198	15210	15222	15235
2117	15247	15260	15272	15284	15297	15309	15321	15334	15346	15358
2118	15371	15383	15395	15408	15420	15432	15445	15457	15469	15482
2119	15494	15506	15519	15531	15543	15556	15568	15580	15593	15605
2120	15617	15630	15642	15654	15667	15679	15691	15704	15716	15728
2121	15741	15753	15765	15778	15790	15802	15815	15827	15839	15852
2122	15864	15875	15886	15897	15908	15920	15931	15942	15953	15964
2123	15976	15987	15998	16009	16021	16032	16043	16054	16065	16077
2124	16088	16099	16110	16121	16133	16144	16155	16166	16177	16189
2125	16200	16211	16222	16234	16245	16256	16267	16278	16290	16301

THEODORE ROOSEVELT LAKE - SALT RIVER PROJECT

COMPUTED
01/05/82
10.12.30.

1981 AREA - CAPACITY TABLES

AREA TABLE IN ACRES   ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2126	16312	16323	16334	16346	16357	16368	16379	16390	16402	16413
2127	16424	16435	16447	16458	16469	16480	16491	16503	16514	16525
2128	16536	16547	16559	16570	16581	16592	16603	16615	16626	16637
2129	16648	16660	16671	16682	16693	16704	16716	16727	16738	16749
2130	16760	16772	16783	16794	16805	16816	16828	16839	16850	16861
2131	16873	16884	16895	16906	16917	16929	16940	16951	16962	16973
2132	16983	16992	17001	17010	17019	17028	17037	17045	17054	17063
2133	17072	17081	17090	17098	17107	17116	17125	17134	17143	17152
2134	17160	17169	17178	17187	17196	17205	17214	17222	17231	17240
2135	17249	17258	17267	17275	17284	17293	17302	17311	17320	17329
2136	17337	17346	17355	17364	17373	17382	17391	17399	17408	17417
2137	17426	17435	17444	17452	17461	17470	17479	17488	17497	17506
2138	17514	17523	17532	17541	17550	17559	17568	17576	17585	17594
2139	17603	17612	17621	17629	17638	17647	17656	17665	17674	[illegible]
2140	17691	17700	17709	17718	17727	17736	17745	17753	17762	17771
2141	17780	17789	17798	17806	17815	17824	17833	17842	17851	17860
2142	17871	17886	17901	17916	17930	17945	17960	17975	17989	18004
2143	18019	18034	18048	18063	18078	18093	18107	18122	18137	18152
2144	18166	18181	18196	18211	18225	18240	18255	18270	18284	18299
2145	18314	18329	18343	18358	18373	18388	18402	18417	18432	18447
2146	18461	18476	18491	18506	18520	18535	18550	18565	18579	18594
2147	18609	18624	18638	18653	18668	18683	18697	18712	18727	18742
2148	18756	18771	18786	18801	18815	18830	18845	18860	18874	18889
2149	18904	18919	18933	18948	18963	18978	18992	19007	19022	19037
2150	19051	19066	19081	19096	19110	19125	19140	19155	19169	19184
2151	19199	19214	19228	19243	19258	19273	19287	19302	19317	19332

ROOSEVELT DAMSITE

AREA-CAPACITY DATA

COMPUTED
10/22/82
09.30.10.

AREA TABLE IN ACRES — ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2152	19347	19397	19446	19496	19545	19595	19644	19694	19743	19793
2153	19842	19892	19941	19991	20040	20090	20139	20189	20238	20288
2154	20337	20387	20436	20486	20535	20585	20634	20684	20733	20783
2155	20832	20882	20931	20981	21030	21080	21129	21179	21228	21278
2156	21328	21377	21427	21476	21526	21575	21625	21674	21724	21773
2157	21823	21872	21922	21971	22021	22070	22120	22169	22219	22268
2158	22318	22367	22417	22466	22516	22565	22615	22664	22714	22763
2159	22813	22862	22912	22961	23011	23060	23110	23159	23209	23258
2160	23308	23323	23339	23354	23370	23385	23401	23416	23432	23447
2161	23463	23478	23493	23509	23524	23540	23555	23571	23586	23602
2162	23617	23633	23648	23664	23679	23694	23710	23725	23741	23756
2163	23772	23787	23803	23818	23834	23849	23864	23880	23895	23911
2164	23926	23942	23957	23973	23988	24004	24019	24035	24050	24065
2165	24081	24096	24112	24127	24143	24158	24174	24189	24205	24220
2166	24235	24251	24266	24282	24297	24313	24328	24344	24359	24375
2167	24390	24405	24421	24436	24452	24467	24483	24498	24514	24529
2168	24545	24560	24576	24591	24606	24622	24637	24653	24668	24684
2169	24699	24715	24730	24746	24761	24776	24792	24807	24823	24838
2170	24854	24869	24885	24900	24916	24931	24946	24962	24977	24993
2171	25008	25024	25039	25055	25070	25086	25101	25117	25132	25147
2172	25163	25178	25194	25209	25225	25240	25256	25271	25287	25302
2173	25317	25333	25348	25364	25379	25395	25410	25426	25441	25457
2174	25472	25488	25503	25518	25534	25549	25565	25580	25596	25611
2175	25627	25642	25658	25673	25688	25704	25719	25735	25750	25766
2176	25781	25797	25812	25828	25843	25858	25874	25889	25905	25920
2177	25936	25951	25967	25982	25998	26013	26029	26044	26059	26075
2178	26090	26106	26121	26137	26152	26168	26183	26199	26214	26229
2179	26245	26260	26276	26291	26307	26322	26338	26353	26369	26384

ROOSEVELT DAMSITE

AREA-CAPACITY DATA

COMPUTED
10/22/82
09.30.10.

AREA TABLE IN ACRES   ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2180	26400	26415	26430	26446	26461	26477	26492	26508	26523	26539
2181	26554	26570	26585	26600	26616	26631	26647	26662	26678	26693
2182	26709	26724	26740	26755	26770	26786	26801	26817	26832	26848
2183	26863	26879	26894	26910	26925	26941	26956	26971	26987	27002
2184	27018	27033	27049	27064	27080	27095	27111	27126	27141	27157
2185	27172	27188	27203	27219	27234	27250	27265	27281	27296	27311
2186	27327	27342	27358	27373	27389	27404	27420	27435	27451	27466
2187	27482	27497	27512	27528	27543	27559	27574	27590	27605	27621
2188	27636	27652	27667	27682	27698	27713	27729	27744	27760	27775
2189	27791	27806	27822	27837	27853	27868	27883	27899	27914	27930
2190	27945	27961	27976	27992	28007	28023	28038	28053	28069	28084
2191	28100	28115	28131	28146	28162	28177	28193	28208	28223	28239
2192	28254	28270	28285	28301	28316	28332	28347	28363	28378	28394
2193	28409	28424	28440	28455	28471	28486	28502	28517	28533	28548
2194	28564	28579	28594	28610	28625	28641	28656	28672	28687	28703
2195	28718	28734	28749	28764	28780	28795	28811	28826	28842	28857
2196	28873	28888	28904	28919	28935	28950	28965	28981	28996	29012
2197	29027	29043	29058	29074	29089	29105	29120	29135	29151	29166
2198	29182	29197	29213	29228	29244	29259	29275	29290	29306	29321
2199	29336	29352	29367	29383	29398	29414	29429	29445	29460	29476
2200	29491	29507	29522	29538	29554	29570	29585	29601	29617	29633
2201	29648	29664	29680	29695	29711	29727	29743	29758	29774	29790
2202	29805	29821	29837	29853	29868	29884	29900	29916	29931	29947
2203	29963	29978	29994	30010	30026	30041	30057	30073	30089	30104
2204	30120	30136	30151	30167	30183	30199	30214	30230	30246	30262
2205	30277	30293	30309	30324	30340	30356	30372	30387	30403	30419
2206	30434	30450	30466	30482	30497	30513	30529	30545	30560	30576
2207	30592	30607	30623	30639	30655	30670	30686	30702	30718	30733
2208	30749	30765	30780	30796	30812	30828	30843	30859	30875	30891
2209	30906	30922	30938	30953	30969	30985	31001	31016	31032	31048

ROOSEVELT DAMSITE

AREA-CAPACITY DATA

COMPUTED
10/22/82
09.30.10.

AREA TABLE IN ACRES — ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2210	31063	31079	31095	31111	31126	31142	31158	31174	31189	31205
2211	31221	31236	31252	31268	31284	31299	31315	31331	31347	31362
2212	31378	31394	31409	31425	31441	31457	31472	31488	31504	31520
2213	31535	31551	31567	31582	31598	31614	31630	31645	31661	31677
2214	31692	31708	31724	31740	31755	31771	31787	31803	31818	31834
2215	31850	31865	31881	31897	31913	31928	31944	31960	31976	31991
2216	32007	32023	32038	32054	32070	32086	32101	32117	32133	32149
2217	32164	32180	32196	32211	32227	32243	32259	32274	32290	32306
2218	32322	32337	32353	32369	32384	32400	32416	32432	32447	32463
2219	32479	32494	32510	32526	32542	32557	32573	32589	32605	32620
2220	32636	32652	32667	32683	32699	32715	32730	32746	32762	32778
2221	32793	32809	32825	32840	32856	32872	32888	32903	32919	32935
2222	32951	32966	32982	32998	33013	33029	33045	33061	33076	33092
2223	33108	33123	33139	33155	33171	33186	33202	33218	33234	33249
2224	33265	33281	33296	33312	33328	33344	33359	33375	33391	33407
2225	33422	33438	33454	33469	33485	33501	33517	33532	33548	33564
2226	33580	33595	33611	33627	33642	33658	33674	33690	33705	33721
2227	33737	33752	33768	33784	33800	33815	33831	33847	33863	33878
2228	33894	33910	33925	33941	33957	33973	33988	34004	34020	34036
2229	34051	34067	34083	34098	34114	34130	34146	34161	34177	34193
2230	34209	34224	34240	34256	34271	34287	34303	34319	34334	34350
2231	34366	34381	34397	34413	34429	34444	34460	34476	34492	34507
2232	34523	34539	34554	34570	34586	34602	34617	34633	34649	34665
2233	34680	34696	34712	34727	34743	34759	34775	34790	34806	34822
2234	34838	34853	34869	34885	34900	34916	34932	34948	34963	34979
2235	34995	35010	35026	35042	35058	35073	35089	35105	35121	35136
2236	35152	35168	35183	35199	35215	35231	35246	35262	35278	35294
2237	35309	35325	35341	35356	35372	35388	35404	35419	35435	35451
2238	35467	35482	35498	35514	35529	35545	35561	35577	35592	35608
2239	35624	35639	35655	35671	35687	35702	35718	35734	35750	35765
2240	35781									

THEODORE ROOSEVELT LAKE - SALT RIVER PROJECT

COMPUTED
01/05/82
10.12.30.

1981 AREA - CAPACITY TABLES

CAPACITY TABLE IN ACRE FEET

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1966	0	1	3	6	10	14	20	27	34	43
1967	52	62	74	86	99	113	128	144	161	179
1968	198	218	239	260	283	307	331	357	383	410
1969	439	468	498	529	561	594	628	663	699	736
1970	774	812	852	893	934	976	1020	1064	1109	1156
1971	1203	1251	1300	1350	1401	1453	1506	1559	1614	1670
1972	1726	1783	1841	1899	1957	2016	2075	2134	2194	2255
1973	2315	2377	2438	2500	2563	2626	2689	2753	2817	2881
1974	2946	3012	3078	3144	3210	3278	3345	3413	3481	3550
1975	3619	3689	3759	3829	3900	3971	4043	4115	4188	4261
1976	4334	4408	4482	4557	4632	4707	4783	4859	4936	5013
1977	5091	5169	5247	5326	5405	5485	5565	5645	5726	5807
1978	5889	5971	6054	6137	6220	6304	6388	6473	6558	6644
1979	6730	6816	6903	6990	7077	7166	7254	7343	7432	7522
1980	7612	7702	7793	7885	7977	8069	8161	8254	8348	8442
1981	8536	8631	8726	8822	8918	9014	9111	9208	9306	9404
1982	9502	9601	9700	9800	9900	10001	10102	10203	10305	10407
1983	10509	10612	10715	10819	10923	11027	11132	11237	11343	11449
1984	11555	11662	11769	11877	11985	12093	12202	12311	12421	12531
1985	12641	12752	12863	12975	13087	13199	13312	13425	13539	13653
1986	13767	13882	13997	14112	14228	14345	14461	14578	14696	14814
1987	14932	15051	15170	15289	15409	15530	15650	15771	15893	16015
1988	16137	16260	16383	16506	16630	16754	16879	17004	17129	17255
1989	17381	17508	17635	17762	17890	18018	18147	18276	18405	18535
1990	18665	18796	18927	19058	19190	19322	19455	19588	19721	19855
1991	19989	20123	20258	20394	20529	20666	20802	20939	21076	21214
1992	21352	21491	21631	21771	21913	22055	22198	22342	22486	22632
1993	22778	22926	23073	23222	23371	23521	23672	23824	23977	24131
1994	24285	24440	24596	24753	24911	25069	25228	25389	25549	25711
1995	25874	26037	26201	26366	26532	26698	26866	27034	27203	27373
1996	27544	27715	27887	28060	28234	28409	28585	28761	28938	29116
1997	29295	29475	29655	29836	30018	30201	30385	30569	30755	30941
1998	31128	31316	31504	31693	31884	32075	32267	32459	32653	32847
1999	33042	33238	33435	33632	33830	34030	34230	34430	34632	34834
2000	35038	35242	35446	35652	35859	36066	36274	36483	36693	36903
2001	37114	37327	37540	37753	37968	38183	38400	38617	38835	39053
2002	39273	39494	39716	39940	40166	40393	40621	40851	41082	41315
2003	41549	41785	42022	42261	42501	42743	42986	43231	43477	43725
2004	43974	44225	44477	44730	44985	45242	45500	45759	46020	46283
2005	46547	46812	47079	47347	47617	47888	48161	48436	48711	48989

1997.9

THEODORE ROOSEVELT LAKE - SALT RIVER PROJECT

1981 AREA - CAPACITY TABLES

COMPUTED
01/05/82
10.12.30.

CAPACITY TABLE IN ACRE FEET — ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2006	49267	49548	49829	50112	50397	50683	50971	51260	51551	51843
2007	52136	52431	52728	53026	53326	53626	53929	54233	54538	54845
2008	55153	55463	55774	56087	56401	56717	57034	57353	57673	57995
2009	58318	58643	58969	59297	59626	59956	60288	60622	60957	61293
2010	61631	61971	62312	62654	62998	63343	63690	64039	64389	64740
2011	65093	65447	65803	66160	66519	66879	67240	67604	67968	68334
2012	68702	69070	69439	69809	70179	70550	70921	71294	71667	72040
2013	72415	72789	73165	73541	73918	74296	74674	75053	75433	75813
2014	76194	76575	76958	77340	77724	78108	78493	78879	79265	79652
2015	80040	80428	80817	81206	81597	81987	82379	82771	83164	83558
2016	83952	84347	84742	85139	85536	85933	86331	86730	87130	87530
2017	87931	88333	88735	89138	89541	89946	90350	90756	91162	91569
2018	91977	92385	92794	93203	93614	94024	94436	94848	95261	95675
2019	96089	96504	96919	97336	97752	98170	98588	99007	99427	99847
2020	100268	100689	101111	101534	101958	102382	102807	103233	103659	104086
2021	104513	104941	105370	105800	106230	106661	107092	107525	107957	108391
2022	108825	109260	109695	110132	110568	111006	111444	111882	112321	112761
2023	113202	113643	114084	114527	114970	115413	115858	116303	116748	117194
2024	117641	118088	118536	118985	119434	119884	120334	120786	121237	121690
2025	122143	122596	123051	123506	123961	124417	124874	125331	125789	126248
2026	126707	127167	127628	128089	128551	129013	129476	129940	130404	130869
2027	131335	131801	132268	132735	133203	133672	134141	134611	135082	135553
2028	136025	136497	136970	137444	137918	138393	138869	139345	139822	140299
2029	140777	141256	141735	142215	142696	143177	143659	144141	144625	145108
2030	145593	146078	146563	147050	147536	148024	148512	149001	149490	149980
2031	150471	150962	151454	151946	152440	152933	153428	153923	154418	154915
2032	155412	155909	156408	156907	157407	157907	158409	158911	159414	159917
2033	160422	160927	161432	161939	162446	162954	163463	163973	164483	164994
2034	165506	166019	166532	167046	167561	168076	168592	169109	169627	170146
2035	170665	171185	171706	172227	172749	173272	173796	174321	174846	175372
2036	175898	176426	176954	177483	178013	178543	179074	179608	180139	180672
2037	181206	181741	182277	182813	183350	183888	184427	184966	185506	186047
2038	186589	187131	187674	188218	188763	189308	189854	190401	190949	191497
2039	192046	192596	193146	193697	194250	194802	195356	195910	196465	197021
2040	197577	198135	198693	199251	199811	200371	200932	201494	202056	202619
2041	203183	203748	204313	204880	205447	206014	206583	207152	207722	208292
2042	208864	209437	210011	210586	211163	211741	212320	212901	213483	214066
2043	214651	215237	215824	216413	217003	217594	218188	218780	219376	219972
2044	220570	221169	221770	222372	222975	223579	224185	224793	225401	226011
2045	226622	227234	227848	228463	229080	229698	230317	230937	231559	232182

THEODORE ROOSEVELT LAKE - SALT RIVER PROJECT

COMPUTED
01/05/82
10.12.30.

1981 AREA - CAPACITY TABLES

CAPACITY TABLE IN ACRE FEET

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2046	232806	233432	234059	234688	235317	235948	236581	237214	237849	238486
2047	239123	239762	240403	241044	241687	242331	242977	243624	244272	244922
2048	245573	246225	246878	247533	248189	248847	249506	250166	250828	251490
2049	252154	252820	253487	254155	254824	255495	256167	256841	257515	258191
2050	258869	259548	260228	260909	261592	262276	262961	263648	264336	265025
2051	265716	266408	267101	267796	268492	269189	269887	270587	271289	271991
2052	272695	273401	274107	274816	275526	276237	276950	277664	278380	279097
2053	279815	280536	281257	281980	282705	283431	284159	284888	285618	286350
2054	287084	287819	288555	289293	290032	290773	291516	292259	293005	293752
2055	294500	295250	296001	296754	297508	298263	299021	299779	300539	301301
2056	302064	302828	303594	304362	305131	305901	306673	307447	308222	308998
2057	309776	310555	311336	312118	312902	313687	314474	315262	316052	316843
2058	317636	318430	319225	320022	320821	321621	322423	323226	324030	324836
2059	325643	326452	327263	328075	328888	329703	330519	331337	332156	332977
2060	333799	334623	335448	336275	337103	337932	338763	339596	340430	341266
2061	342103	342941	343781	344623	345465	346310	347156	348003	348852	349702
2062	350554	351408	352263	353119	353978	354838	355699	356563	357428	358294
2063	359163	360032	360904	361777	362652	363529	364407	365286	366168	367051
2064	367936	368822	369710	370600	371491	372384	373278	374175	375072	375972
2065	376873	377776	378680	379586	380494	381403	382314	383227	384141	385057
2066	385975	386894	387815	388738	389662	390588	391515	392444	393375	394307
2067	395241	396177	397115	398054	398994	399936	400880	401826	402773	403722
2068	404672	405625	406578	407534	408491	409450	410410	411372	412336	413301
2069	414268	415237	416207	417179	418152	419127	420104	421083	422063	423045
2070	424028	425013	426000	426988	427978	428970	429963	430958	431954	432953
2071	433952	434954	435957	436962	437968	438976	439986	440997	442010	443025
2072	444041	445059	446078	447099	448121	449145	450170	451196	452224	453253
2073	454284	455316	456350	457385	458422	459460	460499	461540	462583	463627
2074	464672	465719	466767	467817	468868	469920	470974	472030	473087	474145
2075	475205	476266	477329	478393	479459	480526	481594	482664	483736	484809
2076	485883	486959	488036	489115	490195	491277	492360	493444	494530	495618
2077	496708	497797	498888	499982	501076	502172	503270	504369	505469	506571
2078	507675	508779	509886	510993	512103	513213	514325	515439	516554	517670
2079	518788	519907	521028	522150	523274	524399	525526	526654	527783	528914
2080	530047	531180	532316	533452	534591	535730	536871	538014	539158	540303
2081	541450	542599	543748	544900	546052	547206	548362	549519	550678	551837
2082	552999	554162	555326	556492	557659	558827	559997	561168	562341	563515
2083	564690	565867	567045	568225	569406	570589	571772	572958	574145	575333
2084	576522	577713	578905	580099	581294	582491	583689	584888	586089	587291
2085	588495	589700	590906	592114	593323	594534	595746	596959	598174	599390

THEODORE ROOSEVELT LAKE - SALT RIVER PROJECT

1981 AREA - CAPACITY TABLES

COMPUTED
01/05/82
10.12.30.

CAPACITY TABLE IN ACRE FEET

ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2086	600608	601827	603047	604269	605492	606717	607943	609171	610400	611630
2087	612862	614095	615329	616565	617802	619041	620281	621523	622766	624010
2088	625256	626503	627752	629002	630253	631506	632760	634016	635273	636531
2089	637791	639052	640315	641579	642844	644111	645379	646649	647920	649192
2090	650466	651742	653018	654296	655576	656857	658139	659423	660708	661995
2091	663282	664572	665863	667155	668448	669743	671040	672337	673637	674937
2092	676239	677542	678845	680149	681454	682759	684065	685372	686679	687987
2093	689296	690605	691915	693226	694537	695849	697161	698475	699789	701103
2094	702419	703734	705051	706368	707686	709005	710324	711644	712965	714286
2095	715608	716930	718254	719578	720902	722227	723553	724880	726207	727535
2096	728864	730193	731523	732853	734184	735516	736849	738182	739516	740850
2097	742186	743522	744858	746195	747533	748872	750211	751551	752891	754232
2098	755574	756917	758260	759604	760948	762293	763639	764986	766333	767681
2099	769029	770378	771728	773079	774430	775781	777134	778487	779841	781195
2100	782550	783906	785263	786620	787978	789336	790695	792055	793415	794776
2101	796138	797501	798864	800227	801592	802957	804323	805689	807056	808424
2102	809792	811162	812532	813903	815275	816648	818022	819397	820773	822150
2103	823528	824907	826286	827667	829049	830431	831815	833199	834584	835971
2104	837358	838746	840135	841525	842916	844308	845701	847094	848489	849885
2105	851281	852678	854077	855477	856877	858279	859681	861084	862488	863893
2106	865299	866706	868114	869523	870933	872343	873755	875167	876581	877995
2107	879411	880827	882244	883663	885082	886502	887923	889345	890768	892192
2108	893617	895042	896469	897897	899325	900755	902185	903616	905049	906482
2109	907916	909351	910787	912224	913662	915101	916541	917982	919424	920866
2110	922310	923754	925200	926646	928094	929542	930991	932441	933893	935345
2111	936798	938252	939706	941162	942619	944077	945535	946995	948455	949917
2112	951379	952843	954308	955774	957241	958710	960180	961651	963123	964596
2113	966071	967547	969024	970503	971983	973463	974946	976429	977914	979399
2114	980886	982375	983864	985355	986847	988340	989835	991331	992828	994326
2115	995825	997326	998828	1000331	1001835	1003341	1004848	1006356	1007865	1009375
2116	1010887	1012400	1013914	1015430	1016947	1018465	1019984	1021504	1023026	1024549
2117	1026073	1027598	1029125	1030652	1032181	1033712	1035243	1036776	1038310	1039845
2118	1041382	1042919	1044458	1045998	1047540	1049082	1050626	1052171	1053718	1055265
2119	1056814	1058364	1059915	1061468	1063021	1064576	1066132	1067690	1069249	1070808
2120	1072370	1073932	1075495	1077060	1078626	1080194	1081762	1083332	1084903	1086475
2121	1088049	1089623	1091199	1092776	1094355	1095934	1097515	1099097	1100681	1102265
2122	1103851	1105438	1107026	1108615	1110205	1111797	1113389	1114983	1116578	1118174
2123	1119771	1121369	1122968	1124568	1126170	1127773	1129376	1130981	1132587	1134194
2124	1135802	1137412	1139022	1140634	1142247	1143860	1145475	1147091	1148709	1150327
2125	1151946	1153567	1155189	1156811	1158435	1160060	1161686	1163314	1164942	1166572

21[illegible]	1285120	1286827	1288536	1290245	1291956	1293667	1295379	1297092	1298806	1300520
[illegible]4	1302236	1303952	1305670	1307388	1309107	[illegible]827	1312548	1314270	1315993	1317716
[illegible]	1319441	1321166	1322892	1324619	1326347	[illegible]76	1329806	1331537	1333268	1335000
2136	1336734	1338468	1340203	1341939	1343676	1345414	1347152	1348892	1350632	1352373
2137	1354115	1355858	1357602	1359347	1361093	1362839	1364587	1366335	1368084	1369835
2138	1371586	1373337	1375090	1376844	1378598	1380354	1382110	1383867	1385625	1387384
2139	1389144	1390905	1392667	1394429	1396193	1397957	1399722	1401488	1403255	1405023
2140	1406791	1408561	1410332	1412103	1413875	1415648	1417422	1419197	1420973	1422750
2141	1424527	1426306	1428085	1429865	1431646	1433428	1435211	1436995	1438779	1440565
2142	1442351	1444139	1445929	1447719	1449512	1451306	1453101	1454897	1456696	1458495
2143	1460297	1462099	1463903	1465709	1467516	1469324	1471134	1472946	1474759	1476573
2144	1478389	1480207	1482025	1483846	1485667	1487491	1489316	1491142	1492969	1494799
2145	1496629	1498461	1500295	1502130	1503967	1505805	1507644	1509485	1511328	1513171
2146	1515017	1516864	1518712	1520562	1522413	1524266	1526120	1527976	1529833	1531692
2147	1533552	1535414	1537277	1539141	1541007	1542875	1544744	1546614	1548486	1550360
2148	1552235	1554111	1555989	1557868	1559749	1561631	1563515	1565400	1567287	1569175
2149	1571065	1572956	1574848	1576743	1578638	1580535	1582434	1584334	1586235	1588138
2150	1590042	1591948	1593856	1595764	1597675	1599587	1601500	1603414	1605331	1607248
2151	1609168	1611088	1613010	1614934	1616859	1618785	1620713	1622643	1624574	1626506

ROOSEVELT DAMSITE

AREA-CAPACITY DATA

COMPUTED
10/22/82
09.30.10.

CAPACITY TABLE IN ACRE FEET — ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2152	1628458	1630395	1632337	1634284	1636236	1638193	1640155	1642122	1644094	1646071
2153	1648053	1650039	1652031	1654027	1656029	1658036	1660047	1662063	1664085	1666111
2154	1668142	1670178	1672220	1674266	1676317	1678373	1680434	1682500	1684570	1686646
2155	1688727	1690813	1692903	1694999	1697100	1699205	1701316	1703431	1705551	1707677
2156	1709807	1711942	1714082	1716228	1718378	1720533	1722693	1724858	1727027	1729202
2157	1731382	1733567	1735756	1737951	1740151	1742355	1744565	1746779	1748999	1751223
2158	1753452	1755687	1757926	1760170	1762419	1764673	1766932	1769196	1771465	1773739
2159	1776018	1778301	1780590	1782884	1785182	1787486	1789794	1792108	1794426	1796750
2160	1799078	1801410	1803743	1806077	1808414	1810751	1813091	1815431	1817774	1820118
2161	1822463	1824810	1827159	1829509	1831861	1834214	1836569	1838925	1841283	1843642
2162	1846003	1848366	1850730	1853095	1855462	1857831	1860201	1862573	1864946	1867321
2163	1869698	1872076	1874455	1876836	1879219	1881603	1883988	1886376	1888764	1891155
2164	1893547	1895940	1898335	1900731	1903129	1905529	1907930	1910333	1912737	1915143
2165	1917550	1919959	1922369	1924781	1927195	1929610	1932027	1934445	1936864	1939286
2166	1941708	1944133	1946559	1948986	1951415	1953845	1956277	1958711	1961146	1963583
2167	1966021	1968461	1970902	1973345	1975789	1978235	1980683	1983132	1985583	1988035
2168	1990488	1992944	1995400	1997859	2000319	2002780	2005243	2007707	2010174	2012641
2169	2015110	2017581	2020053	2022527	2025002	2027479	2029958	2032438	2034919	2037402
2170	2039887	2042373	2044861	2047350	2049841	2052333	2054827	2057322	2059819	2062318
2171	2064818	2067319	2069823	2072327	2074833	2077341	2079851	2082361	2084874	2087388
2172	2089903	2092420	2094939	2097459	2099981	2102504	2105029	2107555	2110083	2112613
2173	2115144	2117676	2120210	2122746	2125283	2127822	2130362	2132904	2135447	2137992
2174	2140538	2143086	2145636	2148187	2150740	2153294	2155849	2158407	2160965	2163526
2175	2166088	2168651	2171216	2173783	2176351	2178920	2181491	2184064	2186638	2189214
2176	2191792	2194370	2196951	2199533	2202116	2204702	2207288	2209876	2212466	2215057
2177	2217650	2220244	2222840	2225438	2228037	2230637	2233239	2235843	2238448	2241055
2178	2243663	2246273	2248884	2251497	2254112	2256728	2259345	2261964	2264585	2267207
2179	2269831	2272456	2275083	2277711	2280341	2282973	2285606	2288240	2290876	2293514

ROOSEVELT DAMSITE

AREA-CAPACITY DATA

COMPUTED
10/22/82
09.30.10.

CAPACITY TABLE IN ACRE FEET   ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2180	2296153	2298794	2301436	2304080	2306725	2309372	2312021	2314671	2317322	2319975
2181	2322630	2325286	2327944	2330603	2333264	2335926	2338590	2341256	2343923	2346591
2182	2349261	2351933	2354606	2357281	2359957	2362635	2365314	2367995	2370678	2373362
2183	2376047	2378734	2381423	2384113	2386805	2389498	2392193	2394889	2397587	2400287
2184	2402988	2405690	2408394	2411100	2413807	2416516	2419226	2421938	2424651	2427366
2185	2430083	2432801	2435520	2438241	2440964	2443688	2446414	2449141	2451870	2454600
2186	2457332	2460066	2462801	2465537	2468275	2471015	2473756	2476499	2479243	2481989
2187	2484737	2487486	2490236	2492988	2495742	2498497	2501253	2504012	2506771	2509533
2188	2512295	2515060	2517826	2520593	2523362	2526133	2528905	2531679	2534454	2537230
2189	2540009	2542789	2545570	2548353	2551137	2553923	2556711	2559500	2562291	2565083
2190	2567877	2570672	2573469	2576267	2579067	2581869	2584672	2587476	2590282	2593090
2191	2595899	2598710	2601522	2604336	2607152	2609969	2612787	2615607	2618429	2621252
2192	2624076	2626903	2629730	2632560	2635391	2638223	2641057	2643892	2646729	2649568
2193	2652408	2655250	2658093	2660938	2663784	2666632	2669481	2672332	2675185	2678039
2194	2680894	2683751	2686610	2689470	2692332	2695195	2698060	2700927	2703795	2706664
2195	2709535	2712408	2715282	2718158	2721035	2723914	2726794	2729676	2732559	2735444
2196	2738331	2741219	2744108	2746999	2749892	2752786	2755682	2758579	2761478	2764379
2197	2767281	2770184	2773089	2775996	2778904	2781814	2784725	2787638	2790552	2793468
2198	2796385	2799304	2802225	2805147	2808070	2810995	2813922	2816850	2819780	2822711
2199	2825644	2828579	2831515	2834452	2837391	2840332	2843274	2846218	2849163	2852110
2200	2855058	2858008	2860959	2863912	2866867	2869823	2872781	2875740	2878701	2881664
2201	2884628	2887593	2890560	2893529	2896500	2899471	2902445	2905420	2908397	2911375
2202	2914354	2917336	2920319	2923303	2926289	2929277	2932266	2935257	2938249	2941243
2203	2944239	2947236	2950234	2953235	2956236	2959240	2962245	2965251	2968259	2971269
2204	2974280	2977293	2980307	2983323	2986341	2989360	2992380	2995403	2998426	3001452
2205	3004479	3007507	3010537	3013569	3016602	3019637	3022673	3025711	3028751	3031792
2206	3034834	3037879	3040925	3043972	3047021	3050071	3053124	3056177	3059232	3062289
2207	3065348	3068408	3071469	3074532	3077597	3080663	3083731	3086800	3089871	3092944
2208	3096018	3099094	3102171	3105250	3108330	3111412	3114496	3117581	3120668	3123756
2209	3126846	3129937	3133030	3136125	3139221	3142318	3145418	3148519	3151621	3154725

ROOSEVELT DAMSITE

AREA-CAPACITY DATA

COMPUTED
10/22/82
09.30.10.

CAPACITY TABLE IN ACRE FEET ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2210	3157830	3160938	3164046	3167157	3170268	3173382	3176497	3179613	3182732	3185851
2211	3188973	3192095	3195220	3198346	3201474	3204603	3207733	3210866	3214000	3217135
2212	3220272	3223411	3226551	3229692	3232836	3235981	3239127	3242275	3245425	3248576
2213	3251729	3254883	3258039	3261196	3264355	3267516	3270678	3273842	3277007	3280174
2214	3283342	3286513	3289684	3292857	3296032	3299208	3302386	3305566	3308747	3311929
2215	3315114	3318299	3321487	3324676	3327866	3331058	3334252	3337447	3340644	3343842
2216	3347042	3350243	3353447	3356651	3359857	3363065	3366275	3369485	3372698	3375912
2217	3379128	3382345	3385564	3388784	3392006	3395229	3398454	3401681	3404909	3408139
2218	3411370	3414603	3417838	3421074	3424312	3427551	3430792	3434034	3437278	3440524
2219	3443771	3447019	3450270	3453521	3456775	3460030	3463286	3466544	3469804	3473065
2220	3476328	3479592	3482858	3486126	3489395	3492666	3495938	3499212	3502487	3505764
2221	3509043	3512323	3515604	3518888	3522173	3525459	3528747	3532036	3535328	3538620
2222	3541914	3545210	3548508	3551807	3555107	3558409	3561713	3565018	3568325	3571634
2223	3574944	3578255	3581568	3584883	3588199	3591517	3594837	3598158	3601480	3604804
2224	3608130	3611457	3614786	3618117	3621449	3624782	3628117	3631454	3634792	3638132
2225	3641474	3644817	3648161	3651507	3654855	3658204	3661555	3664908	3668262	3671617
2226	3674974	3678333	3681694	3685055	3688419	3691784	3695151	3698519	3701888	3705260
2227	3708633	3712007	3715383	3718761	3722140	3725521	3728903	3732287	3735672	3739059
2228	3742448	3745838	3749230	3752623	3756018	3759415	3762813	3766212	3769614	3773016
2229	3776421	3779827	3783234	3786643	3790054	3793466	3796880	3800295	3803712	3807130
2230	3810550	3813972	3817395	3820820	3824246	3827674	3831104	3834535	3837968	3841402
2231	3844838	3848275	3851714	3855154	3858597	3862040	3865485	3868932	3872381	3875830
2232	3879282	3882735	3886190	3889646	3893104	3896563	3900024	3903487	3906951	3910416
2233	3913884	3917352	3920823	3924295	3927768	3931243	3934720	3938198	3941678	3945160
2234	3948642	3952127	3955613	3959101	3962590	3966081	3969573	3973067	3976563	3980060
2235	3983559	3987059	3990561	3994064	3997569	4001076	4004584	4008093	4011605	4015118
2236	4018632	4022148	4025666	4029185	4032705	4036228	4039752	4043277	4046804	4050332
2237	4053863	4057394	4060928	4064462	4067999	4071537	4075076	4078618	4082160	4085705
2238	4089250	4092798	4096347	4099898	4103450	4107003	4110559	4114116	4117674	4121234
2239	4124796	4128359	4131924	4135490	4139058	4142627	4146198	4149771	4153345	4156921
2240	4160498									

APPENDIX D.

SRPSIM MODEL BACKGROUND - GENERAL DESCRIPTION, INPUT/OUTPUT, FLOWCHART

The information in this appendix has been provided by the Salt River Project at the request of the Los Angeles District, United States Army Corps of Engineers, and is included as basic information used in this study.

SRPSIM

BACKGROUND

The Salt River Project Simulation Model (SRPSIM) is a program originally written by the U.S. Bureau of Reclamation in 1979 and updated by them in 1982. SRPSIM was written by the Bureau to provide input to the Central Arizona Project Simulation Model (CAPSIM). SRPSIM was modified by SRP personnel in 1985 in order to obtain additional flexibilty in changing reservoir characteristics.

GENERAL OPERATION

SRPSIM is a monthly reservoir operation simulation model. Reservoir operation in the program begins with historic inflows to Roosevelt and Horseshoe Lakes and ends with releases to Granite Reef Dam (see attached schematic diagram). To simplify the modeling effort, the three reservoirs on the Salt River below Roosevelt Dam are treated as one reservoir, so the program models only the following four reservoirs:

Roosevelt Reservoir
Lower Salt Reservoirs
Horseshoe Reservoir
Bartlett Reservoir

For a given water demand, the program determines the amount of groundwater and surface water required to satisfy that demand, based on historic reservoir inflows. The program then operates the reservoirs according to fixed operating criteria and performs an accounting of the major SRP water contracts (see attached flow chart).

Some characteristics of SRPSIM are listed below.

1. SRPSIM works on a monthly time step based on a water year, i.e., input is required, program calculations are performed, and output is printed on a monthly basis by water year (starting in October and ending in September).

2. The length of the planning period can range from 1 month to the number of years contained within the period of record of historic reservoir inflow, which starts in 1889.

SRPSIM

1. Reservoir Operations Model
   A. Simulation Model
   B. Monthly Time-Step

2. Determines Supplies to Meet Given Demands
   A. Groundwater
   B. Surface Water

3. Supplies in Target Year Determined by:
   A. Setting Target Year Reservoir Storage & Demands
   B. Running Historic Inflow Through Reservoir System
   C. Results Give Expected Supplies
   (Resevoir System Yield Varies With Demand)

SRPSIM INPUT

1. **WATER DEMANDS (at Granite Reef)**

   A. SRP (Shareholder & Contract)

   B. Salt River Pima Maricopa Indians

   C. Phoenix Gate Water

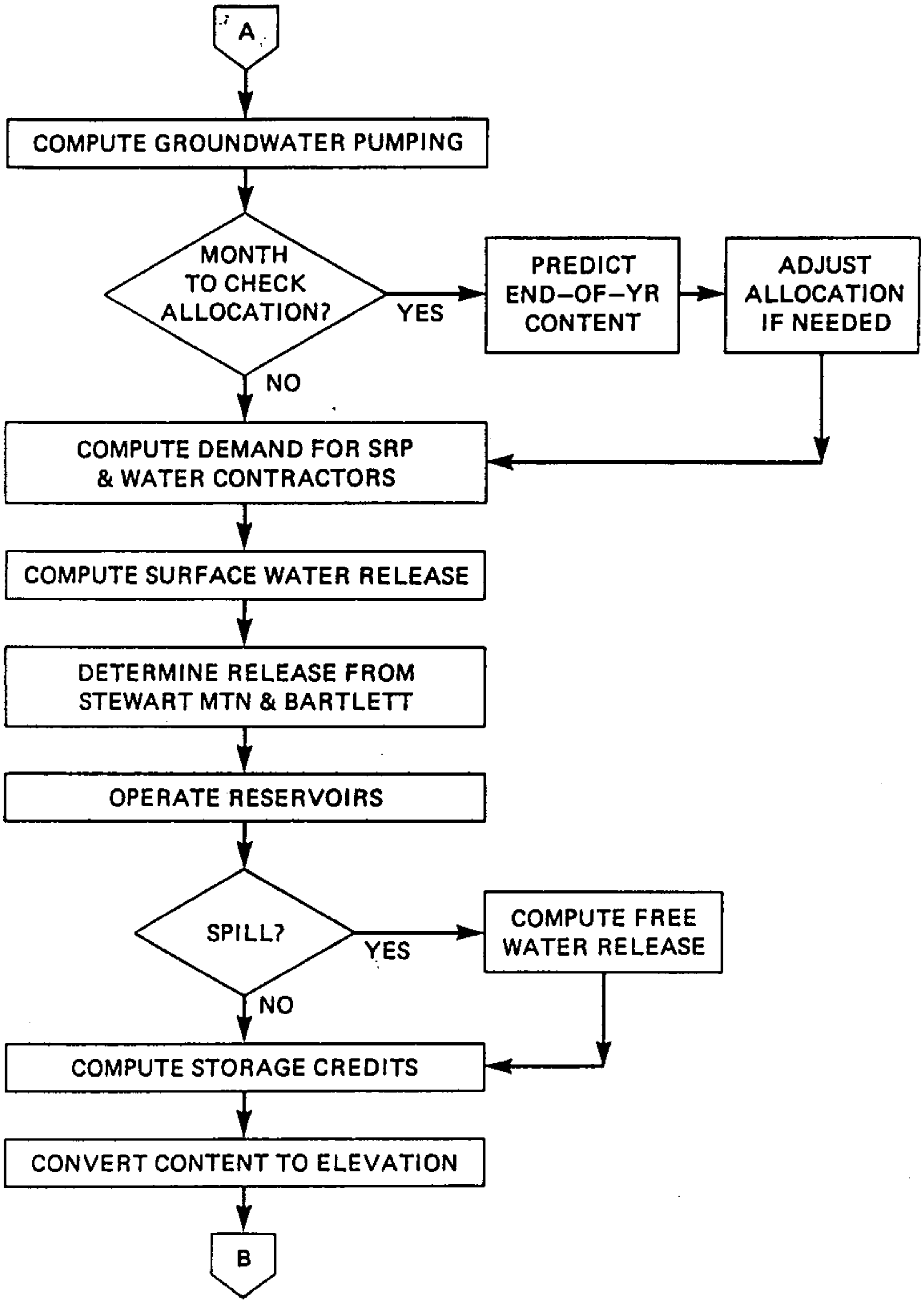
   D. New Conservation Storage

2. **RESERVOIR CAPACITIES (by Reservoir, by Use)**

3. **RESERVOIR INFLOW (Historic)**

SEMI-FIXED INPUT

1. MONTHLY DEMAND DISTRIBUTIONS
2. ALLOCATION INCREASES / REDUCTIONS
3. LOCAL INFLOW
4. RESERVOIR AND RIVER LOSSES
5. GROUNDWATER PUMPING TABLE
6. GROUNDWATER MAX/MIN PUMPING DISTRIBUTIONS
7. HYDRO GENERATION EFFICIENCIES AND MAXIMUM TURBINE FLOWS
8. RESERVOIR NORMAL OPERATION DEVIATION
9. CONTENTS-AREA-ELEVATION TABLES


A
COMPUTE GROUNDWATER PUMPING
MONTH TO CHECK ALLOCATION?
YES
PREDICT END-OF-YR CONTENT
ADJUST ALLOCATION IF NEEDED
NO
COMPUTE DEMAND FOR SRP & WATER CONTRACTORS
COMPUTE SURFACE WATER RELEASE
DETERMINE RELEASE FROM STEWART MTN & BARTLETT
OPERATE RESERVOIRS
SPILL?
YES
COMPUTE FREE WATER RELEASE
NO
COMPUTE STORAGE CREDITS
CONVERT CONTENT TO ELEVATION
B

APPENDIX E.

SRPSIM SUMMARY TABLES, MONTHLY SIMULATIONS

FOR 1995 DEMAND, 1889-1993

The information in this appendix has been provided by the Salt River Project at the request of the Los Angeles District, United States Army Corps of Engineers, and is included as basic data used in this study.

1 Date: 3/ 4/1994 Time: 9:13:57 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1889

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	982.0	1001.4	1185.7	1374.6	1444.1	1571.7	1571.7	1570.9	1517.0	1403.3	1290.6	1186.6	1186.6
SPILL RELEASE	.0	.0	.0	.0	.0	148.9	63.6	.0	.0	.0	.0	.0	212.5
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	372.8	372.8	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	117.0	23.1	.0	.0	.0	.0	.0	140.1
HORSESHOE EOM	61.7	71.8	124.8	124.8	124.8	124.8	124.8	60.7	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	131.8	132.9	13.7	116.4	35.1	.0	.0	.0	.0	.0	429.9
BARTLETT EOM	178.2	178.2	178.2	178.2	178.2	178.2	178.2	178.2	137.2	88.8	62.2	56.0	56.0
VERDE SPILLS @ BARTLETT	.0	.0	116.8	118.4	.0	91.5	12.8	.0	.0	.0	.0	.0	339.4
SPILLS AT GRANITE REEF	.0	.0	116.8	118.4	.0	208.5	35.9	.0	.0	.0	.0	.0	479.5

Date: 3/ 4/1994 Time: 9:13:59 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1890

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1141.6	1153.6	1288.4	1442.5	1571.7	1571.7	1553.8	1528.9	1477.0	1364.5	1349.9	1295.3	1295.3
SPILL RELEASE	.0	.0	.0	.0	81.7	125.1	.0	.0	.0	.0	.0	.0	206.9
LOWER SALT EOM	354.2	354.2	354.2	354.2	372.8	372.8	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	73.3	97.0	.0	.0	.0	.0	.0	.0	170.3
HORSESHOE EOM	.0	.0	25.6	124.8	124.8	124.8	124.8	59.9	.0	.0	.0	38.8	38.8
SPILL RELEASE	.0	.0	.0	.0	232.9	144.3	9.6	.0	.0	.0	.0	.0	386.8
BARTLETT EOM	49.9	30.3	160.4	163.7	178.2	178.2	178.2	178.2	137.7	90.8	171.3	178.2	178.2
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	208.9	112.9	.0	.0	.0	.0	.0	.0	321.8
SPILLS AT GRANITE REEF	.0	.0	.0	.0	282.2	209.9	.0	.0	.0	.0	.0	.0	492.1

Date: 3/ 4/1994 Time: 9:14: 1 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1891

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1313.0	1434.7	1571.7	1571.7	1571.7	1571.7	1571.7	1571.7	1568.5	1462.4	1353.6	1257.5	1257.5
SPILL RELEASE	.0	.0	.0	62.7	1074.7	74.4	.0	.0	.0	.0	.0	.0	1211.8
LOWER SALT EOM	354.2	354.2	354.3	372.8	372.8	372.8	372.0	372.8	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	54.6	1057.4	49.8	.0	.0	.0	.0	.0	.0	1161.7
HORSESHOE EOM	104.1	124.8	124.8	124.8	124.8	124.8	124.8	119.6	31.5	.0	.0	.0	.0
SPILL RELEASE	.0	84.7	180.8	79.5	914.5	109.2	19.8	.0	.0	.0	.0	.0	1388.5
BARTLETT EOM	178.2	178.2	178.2	178.2	178.2	178.2	178.2	178.2	178.2	166.3	143.6	145.6	145.6
VERDE SPILLS @ BARTLETT	.0	67.8	162.2	69.1	918.0	73.1	.0	.0	.0	.0	.0	.0	1290.2
SPILLS AT GRANITE REEF	.0	67.8	162.2	123.7	1975.4	122.9	.0	.0	.0	.0	.0	.0	2451.9

Date: 3/ 4/1994 Time: 9:14: 2 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1892

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1214.5	1224.6	1220.0	1240.4	1250.3	1198.0	1109.5	1057.7	921.2	786.9	676.8	590.2	590.2
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	141.2	120.4	120.3	108.0	68.9	47.2	42.9	.1	.1	.1	2.8	3.8	3.8
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14: 4 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1893

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	564.7	566.8	572.0	588.9	628.4	730.0	733.0	707.2	621.9	518.2	470.7	424.4	424.4
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	8.3	14.7	22.9	23.2	34.6	52.9	49.5	24.6	.1	4.7	44.9	67.1	67.1
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14: 5 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1894

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	440.2	453.7	470.5	488.5	502.7	490.2	473.1	429.1	376.6	295.8	253.5	221.1	221.1
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	46.6	43.4	39.0	36.3	18.8	42.9	43.8	30.9	1.9	.1	18.5	27.1	27.1
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14: 7 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1895

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	208.1	218.8	242.8	573.7	648.1	750.9	793.5	748.4	652.3	613.6	588.1	536.2	536.2
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	122.1	124.8	124.8	124.8	103.5	79.8	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	50.9	181.3	21.2	.0	.0	.0	.0	.0	253.3
BARTLETT EOM	32.5	31.2	43.1	160.4	178.2	178.2	178.2	178.2	178.2	159.8	104.4	73.4	73.4
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	36.9	149.7	.0	.0	.0	.0	.0	.0	186.7
SPILLS AT GRANITE REEF	.0	.0	.0	.0	36.9	149.7	.0	.0	.0	.0	.0	.0	186.7

Date: 3/ 4/1994 Time: 9:14: 8 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1896

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	583.8	626.7	663.1	689.8	710.4	680.8	647.6	615.1	517.1	445.8	397.1	363.0	363.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	51.5	58.3	53.6	49.3	22.0	30.1	34.0	4.8	.1	44.1	86.8	96.4	96.4
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:10 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1897

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	383.2	407.5	426.4	588.6	640.6	769.3	964.5	968.9	923.1	808.1	715.0	696.1	696.1
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	43.1	48.8	56.9	63.4	18.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	80.0	94.2	92.6	160.4	160.4	160.4	178.2	178.2	122.2	97.7	110.4	122.4	122.4
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:12 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1898

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	724.3	737.7	753.5	773.4	803.9	840.4	786.8	722.0	610.7	512.0	428.9	381.3	381.3
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	89.9	84.0	70.5	61.5	44.7	.1	10.7	.1	.1	5.6	21.6	33.0	33.0
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:13 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1899

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	360.1	370.1	387.9	409.3	429.1	450.5	430.7	387.3	314.2	256.9	233.6	201.8	201.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	34.1	29.5	30.7	39.3	33.8	.1	3.7	.1	.1	13.9	31.8	44.3	44.3
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:15 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1900

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	214.1	224.6	236.1	250.1	261.5	272.9	240.2	195.9	115.4	33.2	14.7	14.7	14.7
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	320.8	283.1	283.1
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	48.3	48.0	47.1	48.1	39.1	2.6	.1	.1	.1	.1	.4	.1	.1
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:16 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1901

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	14.7	14.7	14.7	14.7	131.8	217.0	273.8	260.6	217.9	152.5	116.4	88.8	88.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	276.0	298.2	310.4	338.0	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	.1	14.4	16.2	29.1	115.9	129.7	86.0	75.8	45.5	48.3	77.2	68.6	68.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:18 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1902

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	95.4	105.7	117.0	128.2	138.7	148.9	141.5	97.3	30.7	14.7	14.7	14.7	14.7
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	296.9	271.7	295.6	295.6
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	46.0	47.1	49.6	53.0	46.5	15.4	.1	1.5	.1	.1	21.0	76.5	76.5
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:19 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1903

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	14.7	14.7	14.7	14.7	29.1	64.3	114.1	71.5	14.7	14.7	17.7	14.7	14.7
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	302.0	312.3	339.2	351.6	354.2	354.2	354.2	354.2	352.2	347.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	63.7	58.5	42.1	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	58.0	58.4	73.5	79.8	82.2	132.3	178.2	178.2	178.2	147.6	102.7	93.6	93.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:21 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1904

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	28.3	39.9	52.4	65.7	77.2	88.5	92.9	47.1	14.7	14.7	14.7	14.7	14.7
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	321.9	270.0	304.9	329.5	329.5
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	83.6	82.5	82.4	86.5	79.6	49.5	9.0	6.7	.1	35.8	126.6	106.6	106.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:22 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1905

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	14.7	14.7	24.6	123.4	578.2	1514.2	1571.7	1571.7	1571.7	1492.6	1404.5	1328.8	1328.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	608.5	153.6	11.6	.0	.0	.0	773.7
LOWER SALT EOM	344.9	353.8	354.2	354.2	354.2	354.2	372.8	372.8	372.8	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	577.2	92.0	.0	.0	.0	.0	669.2
HORSESHOE EOM	.0	.0	.0	13.1	124.8	124.8	124.8	124.8	30.2	.0	.0	2.7	2.7
SPILL RELEASE	.0	.0	.0	.0	289.3	508.1	285.4	34.0	.0	.0	.0	.0	1116.8
BARTLETT EOM	90.6	91.0	93.7	160.4	178.2	178.2	178.2	178.2	178.2	160.8	156.4	178.2	178.2
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	277.5	480.7	270.7	20.4	.0	.0	.0	.0	1049.2
SPILLS AT GRANITE REEF	.0	.0	.0	.0	277.5	480.7	847.9	112.4	.0	.0	.0	.0	1718.4

Date: 3/ 4/1994 Time: 9:14:24 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1906

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1292.5	1571.7	1571.7	1571.7	1571.7	1571.7	1571.7	1571.7	1558.2	1459.8	1388.3	1297.4	1297.4
SPILL RELEASE	.0	78.9	67.1	62.4	76.3	381.8	187.0	.0	.0	.0	.0	.0	853.4
LOWER SALT EOM	354.2	372.8	372.8	372.8	372.8	372.8	372.8	372.8	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	69.2	52.8	51.1	47.7	349.2	132.7	.0	.0	.0	.0	.0	702.6
HORSESHOE EOM	15.5	124.8	124.8	124.8	124.8	124.8	124.8	99.6	.0	.0	.0	.0	.0
SPILL RELEASE	.0	60.6	43.9	40.3	10.3	315.6	49.8	.0	.0	.0	.0	.0	520.5
BARTLETT EOM	178.2	178.2	178.2	178.2	178.2	178.2	178.2	178.2	176.0	128.8	135.6	126.4	126.4
VERDE SPILLS @ BARTLETT	.0	53.2	34.5	33.0	6.4	302.8	35.4	.0	.0	.0	.0	.0	465.3
SPILLS AT GRANITE REEF	.0	122.3	87.3	84.1	54.2	652.0	168.0	.0	.0	.0	.0	.0	1167.9

Date: 3/ 4/1994 Time: 9:14:25 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1907

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1258.6	1271.4	1553.1	1571.7	1571.7	1571.7	1571.7	1568.2	1527.3	1423.9	1379.1	1327.7	1327.7
SPILL RELEASE	.0	.0	.0	135.0	138.4	132.0	.0	.0	.0	.0	.0	.0	405.4
LOWER SALT EOM	354.2	354.2	354.2	372.8	372.8	372.8	372.7	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	123.9	118.8	109.5	.0	.0	.0	.0	.0	.0	352.2
HORSESHOE EOM	.0	.0	92.5	124.8	124.8	124.8	124.8	63.9	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	91.9	90.6	217.3	38.3	.0	.0	.0	.0	.0	438.1
BARTLETT EOM	118.9	104.3	160.4	178.2	178.2	178.2	178.2	178.2	144.2	96.3	83.9	89.7	89.7
VERDE SPILLS @ BARTLETT	.0	.0	.0	84.4	77.8	186.4	.0	.0	.0	.0	.0	.0	348.6
SPILLS AT GRANITE REEF	.0	.0	.0	208.3	196.6	296.0	.0	.0	.0	.0	.0	.0	700.9

Date: 3/ 4/1994 Time: 9:14:27 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1908

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1351.7	1372.5	1364.9	1362.4	1532.1	1571.7	1568.9	1556.5	1510.7	1429.1	1431.2	1376.7	1376.7
SPILL RELEASE	.0	.0	.0	.0	.0	72.0	.0	.0	.0	.0	.0	.0	72.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	372.8	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	23.5	.0	.0	.0	.0	.0	.0	23.5
HORSESHOE EOM	.0	.0	.0	.0	85.6	124.8	124.8	75.3	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	18.5	5.5	.0	.0	.0	.0	.0	24.0
BARTLETT EOM	107.7	120.6	130.9	140.2	160.4	178.2	178.2	178.2	152.3	119.9	135.6	135.5	135.5
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	6.0	.0	.0	.0	.0	.0	.0	6.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	29.6	.0	.0	.0	.0	.0	.0	29.6

Date: 3/ 4/1994 Time: 9:14:29 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1909

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1331.2	1329.5	1527.3	1569.1	1571.7	1571.7	1571.7	1553.9	1520.7	1418.3	1364.4	1386.6	1386.6
SPILL RELEASE	.0	.0	.0	.0	165.3	81.4	106.2	.0	.0	.0	.0	.0	352.9
LOWER SALT EOM	354.2	354.2	354.2	354.2	372.8	372.8	372.8	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	137.1	56.1	63.1	.0	.0	.0	.0	.0	256.3
HORSESHOE EOM	.0	.0	124.8	124.8	124.8	124.8	124.8	60.9	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	10.5	98.7	24.1	114.4	63.0	.0	.0	.0	.0	.0	310.7
BARTLETT EOM	142.5	140.9	178.2	178.2	178.2	178.2	178.2	178.2	137.1	99.2	142.2	148.8	148.8
VERDE SPILLS @ BARTLETT	.0	.0	.0	80.2	20.0	78.9	37.4	.0	.0	.0	.0	.0	216.5
SPILLS AT GRANITE REEF	.0	.0	.0	80.2	157.1	134.9	100.5	.0	.0	.0	.0	.0	472.7

Date: 3/ 4/1994 Time: 9:14:30 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1910

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1347.4	1371.7	1355.2	1425.8	1456.4	1434.3	1379.3	1343.2	1281.7	1163.2	1059.4	998.6	998.6
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	10.0	124.8	113.6	124.8	124.8	61.7	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	78.7	.0	39.4	37.8	.0	.0	.0	.0	.0	155.9
BARTLETT EOM	147.9	158.6	160.4	178.2	160.4	178.2	178.2	178.2	148.9	112.2	110.5	76.0	76.0
VERDE SPILLS @ BARTLETT	.0	.0	.0	60.2	.0	.0	.0	.0	.0	.0	.0	.0	60.2
SPILLS AT GRANITE REEF	.0	.0	.0	60.2	.0	.0	.0	.0	.0	.0	.0	.0	60.2

Date: 3/ 4/1994 Time: 9:14:32 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1911

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	952.8	967.2	961.4	1093.1	1251.3	1451.7	1405.2	1373.5	1322.9	1232.5	1130.1	1110.0	1110.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	45.0	124.8	124.8	124.8	81.4	2.4	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	110.1	13.3	.0	.0	.0	.0	.0	123.4
BARTLETT EOM	71.1	55.9	54.8	160.4	171.9	178.2	178.2	178.2	178.2	163.0	154.2	95.7	95.7
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	50.0	.0	.0	.0	.0	.0	.0	50.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	50.0	.0	.0	.0	.0	.0	.0	50.0

Date: 3/ 4/1994 Time: 9:14:33 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1912

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1109.0	1129.1	1120.9	1112.2	1123.0	1234.6	1307.7	1311.7	1267.0	1161.6	1071.9	993.0	993.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	4.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	120.9	116.7	134.4	141.9	109.8	109.2	178.2	134.7	63.4	47.2	62.2	64.5	64.5
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:35 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1913

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1012.6	1026.4	1021.9	1037.6	1066.1	1065.4	1115.4	1086.9	1032.5	920.3	814.7	736.5	736.5
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	50.5	40.3	44.0	32.3	24.0	126.4	159.2	107.6	35.9	15.5	19.5	31.8	31.8
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:36 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1914

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	702.0	722.3	749.0	768.0	881.7	954.6	964.4	929.5	879.2	781.5	734.4	685.0	685.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	36.8	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	34.8	33.0	22.0	72.1	160.4	153.1	117.2	70.6	1.0	.1	5.3	10.0	10.0
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:38 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1915

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	682.7	713.3	886.1	1073.8	1338.2	1528.1	1571.7	1571.7	1571.7	1557.2	1472.3	1378.3	1378.3
SPILL RELEASE	.0	.0	.0	.0	.0	.0	213.9	190.4	9.2	.0	.0	.0	413.5
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	372.8	372.8	372.8	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	172.2	137.6	.0	.0	.0	.0	309.9
HORSESHOE EOM	.0	.0	.0	.0	40.4	124.8	124.8	124.8	26.7	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	115.7	120.6	79.3	.0	.0	.0	.0	315.6
BARTLETT EOM	21.3	18.0	50.2	105.1	160.4	178.2	178.2	178.2	178.2	164.1	147.3	136.8	136.8
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	57.1	98.2	57.3	.0	.0	.0	.0	212.7
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	57.1	270.5	195.0	.0	.0	.0	.0	522.6

Date: 3/ 4/1994 Time: 9:14:40 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1916

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1329.7	1332.4	1331.8	1571.7	1571.7	1571.7	1571.7	1571.7	1571.7	1473.3	1400.3	1347.4	1347.4
SPILL RELEASE	.0	.0	.0	931.3	285.7	460.8	163.5	.0	.0	.0	.0	.0	1841.2
LOWER SALT EOM	354.2	354.2	354.2	372.8	372.8	372.8	372.8	372.8	355.0	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	917.8	265.2	424.6	105.4	.0	.0	.0	.0	.0	1712.9
HORSESHOE EOM	.0	.0	.0	124.8	124.8	124.8	124.8	115.6	14.1	.0	.0	12.2	12.2
SPILL RELEASE	.0	.0	.0	344.9	163.3	299.5	29.6	.0	.0	.0	.0	.0	837.3
BARTLETT EOM	140.3	135.5	141.7	178.2	178.2	178.2	178.2	178.2	178.2	142.2	134.2	178.2	178.2
VERDE SPILLS @ BARTLETT	.0	.0	.0	339.9	151.6	288.9	19.1	.0	.0	.0	.0	.0	799.4
SPILLS AT GRANITE REEF	.0	.0	.0	1257.7	416.8	713.5	124.4	.0	.0	.0	.0	.0	2512.4

Date: 3/ 4/1994 Time: 9:14:41 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1917

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1386.5	1384.6	1369.9	1457.7	1555.9	1543.8	1571.7	1571.7	1551.4	1456.9	1366.2	1268.6	1268.6
SPILL RELEASE	.0	.0	.0	.0	.0	.0	47.8	.0	.0	.0	.0	.0	47.8
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	372.8	372.8	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	39.6	.0	.0	.0	.0	.0	39.6
HORSESHOE EOM	36.9	46.1	65.4	124.8	124.8	124.8	124.8	124.8	27.7	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	26.3	99.4	335.3	13.1	.0	.0	.0	.0	474.1
BARTLETT EOM	178.2	178.2	169.8	177.1	178.2	178.2	178.2	178.2	178.2	169.7	175.9	177.6	177.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	38.5	293.7	.0	.0	.0	.0	.0	332.3
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	38.5	333.4	.0	.0	.0	.0	.0	371.9

Date: 3/ 4/1994 Time: 9:14:43 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1918

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1227.5	1240.7	1235.5	1233.5	1264.2	1336.9	1274.3	1193.2	1086.3	1045.6	1018.0	973.6	973.6
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	124.8	124.8	106.5	81.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	105.8	8.6	.0	.0	.0	.0	.0	114.4
BARTLETT EOM	172.2	149.0	142.2	151.8	145.7	178.2	178.2	178.2	178.2	171.3	122.6	74.2	74.2
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	44.9	.0	.0	.0	.0	.0	.0	44.9
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	44.9	.0	.0	.0	.0	.0	.0	44.9

Date: 3/ 4/1994 Time: 9:14:44 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1919

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	979.4	994.0	998.0	1017.0	1109.9	1153.8	1335.3	1352.0	1306.6	1406.2	1401.4	1337.9	1337.9
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	28.3	22.7	38.5	32.4	38.3	125.5	152.9	101.0	19.0	116.6	149.8	167.2	167.2
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:46 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1920

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1314.0	1466.8	1571.7	1571.7	1571.7	1571.7	1571.7	1571.7	1560.4	1451.2	1371.0	1272.5	1272.5
SPILL RELEASE	.0	.0	195.0	173.0	643.3	120.7	44.1	.0	.0	.0	.0	.0	1176.1
LOWER SALT EOM	354.2	354.2	372.8	372.8	372.8	372.8	372.8	372.8	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	181.9	162.9	625.1	88.8	12.6	.0	.0	.0	.0	.0	1071.3
HORSESHOE EOM	18.4	124.8	124.8	124.8	124.8	124.8	124.8	110.8	12.1	.0	.0	.0	.0
SPILL RELEASE	.0	36.7	128.6	129.0	469.2	106.4	50.5	.0	.0	.0	.0	.0	920.3
BARTLETT EOM	178.2	178.2	178.2	178.2	178.2	178.2	178.2	178.2	178.2	139.1	127.8	119.8	119.8
VERDE SPILLS @ BARTLETT	.0	21.4	120.4	122.0	455.9	78.3	14.4	.0	.0	.0	.0	.0	812.3
SPILLS AT GRANITE REEF	.0	21.4	302.3	284.9	1081.0	167.1	27.0	.0	.0	.0	.0	.0	1883.6

Date: 3/ 4/1994 Time: 9:14:48 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1921

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1236.2	1268.6	1268.9	1290.1	1269.6	1211.9	1172.3	1126.6	1037.6	949.3	1075.2	1061.9	1061.9
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	114.3	105.9	110.2	99.5	109.2	129.7	88.0	38.4	.1	.1	93.5	85.0	85.0
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:49 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1922

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1078.1	1091.2	1120.1	1181.1	1281.0	1469.6	1493.2	1491.0	1445.6	1341.3	1252.8	1150.8	1150.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	87.6	124.8	124.8	124.8	66.3	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	52.3	114.3	51.6	.0	.0	.0	.0	.0	218.2
BARTLETT EOM	58.2	53.2	112.2	160.4	178.2	178.2	178.2	178.2	146.5	100.9	85.5	81.2	81.2
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	21.5	55.1	.0	.0	.0	.0	.0	.0	76.6
SPILLS AT GRANITE REEF	.0	.0	.0	.0	21.5	55.1	.0	.0	.0	.0	.0	.0	76.6

Date: 3/ 4/1994 Time: 9:14:51 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1923

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1106.8	1118.9	1140.7	1138.2	1187.0	1327.9	1305.4	1283.0	1229.7	1130.3	1070.3	1087.2	1087.2
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	19.3	37.7	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	74.2	55.0	109.7	118.3	135.5	160.4	178.2	162.9	83.8	59.4	58.7	164.6	164.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:52 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1924

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1107.2	1176.2	1445.6	1522.1	1554.2	1530.0	1571.7	1571.7	1543.3	1430.2	1323.1	1217.7	1217.7
SPILL RELEASE	.0	.0	.0	.0	.0	.0	38.5	.0	.0	.0	.0	.0	38.5
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	372.8	372.8	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	14.8	.0	.0	.0	.0	.0	14.8
HORSESHOE EOM	.0	.0	124.8	124.8	106.8	124.8	124.8	66.8	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	59.9	51.2	.0	.0	71.5	.0	.0	.0	.0	.0	182.6
BARTLETT EOM	124.5	157.4	178.2	178.2	160.4	163.3	178.2	178.2	142.5	94.7	64.1	57.0	57.0
VERDE SPILLS @ BARTLETT	.0	.0	38.1	33.4	.0	.0	27.6	.0	.0	.0	.0	.0	99.1
SPILLS AT GRANITE REEF	.0	.0	38.1	33.4	.0	.0	42.4	.0	.0	.0	.0	.0	113.9

Date: 3/ 4/1994 Time: 9:14:54 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL
RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1925

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1172.6	1181.8	1179.1	1172.4	1184.5	1165.2	1100.1	1050.6	925.8	804.0	725.0	691.8	691.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	53.2	30.3	36.9	42.3	6.0	24.0	43.5	.1	.1	.1	14.1	76.7	76.7
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:55 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL
RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1926

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	718.7	737.1	755.1	771.0	785.6	797.2	1114.5	1177.0	1096.3	1061.8	1033.4	982.9	982.9
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	124.8	116.1	81.1	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	5.6	.0	.0	.0	.0	.0	5.6
BARTLETT EOM	76.2	76.2	70.9	65.2	37.9	75.8	178.2	178.2	178.2	167.1	100.2	84.9	84.9
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:14:57 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1927

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	994.5	1007.6	1022.4	1045.6	1400.6	1473.4	1507.9	1529.7	1502.1	1398.1	1307.8	1247.3	1247.3
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	124.8	124.8	124.8	64.2	.0	.0	.0	25.6	25.6
SPILL RELEASE	.0	.0	.0	.0	128.1	123.3	39.4	.0	.0	.0	.0	.0	290.8
BARTLETT EOM	46.9	37.6	56.6	52.3	178.2	178.2	178.2	178.2	148.2	108.1	104.7	178.2	178.2
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	97.1	63.8	.0	.0	.0	.0	.0	.0	160.8
SPILLS AT GRANITE REEF	.0	.0	.0	.0	97.1	63.8	.0	.0	.0	.0	.0	.0	160.8

Date: 3/ 4/1994 Time: 9:14:59 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1928

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1205.3	1216.2	1233.0	1227.1	1281.0	1248.8	1229.4	1198.0	1145.6	1039.2	946.1	881.8	881.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	24.5	6.8	9.0	26.2	61.2	115.7	54.8	2.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	178.2	178.2	160.4	160.4	160.4	160.4	178.2	178.2	103.3	77.7	95.5	74.9	74.9
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15: 0 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1929

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	893.4	909.6	904.9	924.3	946.7	919.2	998.3	964.4	911.0	805.7	762.4	731.1	731.1
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	1.5	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	36.7	29.8	39.8	35.5	13.9	94.5	178.2	132.3	62.1	45.4	73.5	87.9	87.9
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15: 2 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1930

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	752.7	766.9	780.8	801.0	797.1	922.7	934.4	910.5	821.1	736.0	686.2	608.4	608.4
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	48.6	42.1	29.2	24.2	42.1	44.1	69.2	26.7	.1	.1	31.8	40.3	40.3
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15: 3 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL
RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1931

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	575.4	598.6	616.9	629.1	825.2	878.5	912.2	919.7	867.5	748.9	703.3	685.4	685.4
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	23.1	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	45.3	59.4	56.2	47.8	160.4	138.7	106.4	66.8	.1	.1	41.9	56.2	56.2
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15: 5 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL
RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1932

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	752.5	807.7	911.7	976.4	1457.2	1571.7	1571.7	1571.7	1546.7	1450.6	1383.4	1297.5	1297.5
SPILL RELEASE	.0	.0	.0	.0	.0	27.4	98.1	.0	.0	.0	.0	.0	125.5
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	372.8	372.8	372.8	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	21.2	51.0	.0	.0	.0	.0	.0	72.2
HORSESHOE EOM	.0	.0	.0	.0	124.8	124.8	124.8	74.3	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	137.0	222.6	37.3	.0	.0	.0	.0	.0	396.8
BARTLETT EOM	20.9	40.2	75.7	83.5	178.2	178.2	178.2	178.2	151.4	105.4	83.0	70.8	70.8
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	107.1	178.3	19.4	.0	.0	.0	.0	.0	304.8
SPILLS AT GRANITE REEF	.0	.0	.0	.0	107.1	199.5	70.4	.0	.0	.0	.0	.0	377.0

Date: 3/ 4/1994 Time: 9:15: 6 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1933

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1261.3	1272.6	1270.6	1272.2	1284.4	1309.0	1269.6	1274.0	1228.8	1112.8	1018.6	940.8	940.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	71.0	47.6	44.9	56.3	48.8	88.3	104.4	64.1	.1	.1	.1	6.1	6.1
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15: 8 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1934

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	920.5	920.7	919.0	918.6	934.1	879.1	799.0	721.5	600.1	490.0	445.6	406.9	406.9
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	12.4	16.8	23.4	31.6	1.8	7.7	15.3	.1	.1	.1	21.1	25.8	25.8
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:10 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1935

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	386.4	399.4	413.4	488.2	643.1	836.7	987.6	997.3	972.2	861.3	809.1	793.7	793.7
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	21.5	82.8	94.2	44.6	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	27.1	26.3	28.1	82.9	160.4	160.4	178.2	178.2	147.2	122.9	122.3	93.6	93.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:11 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1936

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	802.3	815.3	831.0	845.2	980.6	1038.5	1193.7	1203.2	1116.8	991.1	902.1	837.6	837.6
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	55.5	48.5	36.1	28.2	35.8	90.0	83.5	34.0	.1	.1	19.3	30.2	30.2
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:13 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1937

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	805.5	822.8	824.7	861.7	1193.6	1479.4	1571.7	1571.7	1543.7	1434.7	1328.9	1226.3	1226.3
SPILL RELEASE	.0	.0	.0	.0	.0	.0	6.1	.0	.0	.0	.0	.0	6.1
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	372.8	372.8	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	1.3	.0	.0	.0	.0	.0	1.3
HORSESHOE EOM	.0	.0	.0	.0	124.8	124.8	124.8	75.8	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	76.2	180.9	78.7	.0	.0	.0	.0	.0	335.8
BARTLETT EOM	34.6	31.2	40.7	45.5	178.2	178.2	178.2	178.2	153.3	106.8	79.1	70.5	70.5
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	45.1	121.3	16.5	.0	.0	.0	.0	.0	182.9
SPILLS AT GRANITE REEF	.0	.0	.0	.0	45.1	121.3	17.8	.0	.0	.0	.0	.0	184.2

Date: 3/ 4/1994 Time: 9:15:14 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1938

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1182.6	1191.5	1184.2	1175.8	1188.7	1266.0	1248.2	1211.7	1155.5	1043.4	962.5	916.8	916.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	124.8	90.1	31.6	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	4.8	.0	.0	.0	.0	.0	.0	4.8
BARTLETT EOM	64.4	41.1	35.8	39.2	7.2	178.2	178.2	178.2	128.7	101.4	104.6	75.8	75.8
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:16 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1939

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	920.7	927.9	922.4	938.2	926.8	941.8	1007.2	977.2	855.5	719.9	628.7	552.2	552.2
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	30.0	17.5	30.5	22.6	34.1	81.2	50.3	4.2	.1	.1	11.1	90.3	90.3
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:17 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1940

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	559.6	571.3	584.1	600.3	638.5	687.8	659.3	609.1	511.2	403.8	329.6	294.5	294.5
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	54.6	50.3	40.0	38.7	52.9	.1	8.5	.1	.1	.1	14.7	26.3	26.3
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:19 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL
RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1941

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	300.1	330.3	585.5	855.2	1080.4	1571.7	1571.7	1571.7	1571.7	1507.2	1425.3	1344.8	1344.8
SPILL RELEASE	.0	.0	.0	.0	.0	145.2	312.0	238.4	19.0	.0	.0	.0	714.6
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	372.8	372.8	372.8	372.8	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	133.9	286.8	170.9	.0	.0	.0	.0	591.6
HORSESHOE EOM	.0	.0	45.1	123.7	124.8	124.8	124.8	124.8	27.1	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	160.7	273.3	267.4	26.6	.0	.0	.0	.0	728.0
BARTLETT EOM	65.5	77.8	160.4	160.4	178.2	178.2	178.2	178.2	178.2	158.8	137.3	137.0	137.0
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	146.2	252.1	245.7	19.1	.0	.0	.0	.0	663.1
SPILLS AT GRANITE REEF	.0	.0	.0	.0	146.2	386.0	532.5	190.0	.0	.0	.0	.0	1254.7

Date: 3/ 4/1994 Time: 9:15:21 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL
RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1942

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1337.1	1341.8	1360.2	1415.2	1405.8	1404.5	1444.0	1442.5	1391.8	1278.0	1182.0	1084.3	1084.3
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	22.3	47.9	60.4	114.6	124.8	67.6	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	1.3	.0	.0	.0	.0	.0	1.3
BARTLETT EOM	151.4	163.8	160.4	160.4	160.4	160.4	178.2	178.2	147.3	99.1	76.2	68.6	68.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:22 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1943

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1045.9	1059.5	1061.8	1137.8	1198.7	1327.8	1331.6	1307.0	1251.5	1122.6	1027.0	943.7	943.7
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	66.1	47.8	47.7	46.9	35.6	141.7	147.3	93.7	16.2	.1	13.8	17.1	17.1
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:24 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1944

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	907.9	902.5	895.2	909.6	948.5	982.7	1021.9	1005.4	955.1	842.2	757.4	700.8	700.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	32.2	70.7	31.9	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	22.7	27.1	35.5	28.1	29.3	160.4	178.2	178.2	136.2	113.0	91.8	75.8	75.8
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:25 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL
RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1945

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	714.6	729.2	726.0	747.3	784.5	852.6	971.6	987.8	938.5	826.6	743.0	675.4	675.4
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	37.5	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	37.1	32.6	41.9	37.6	24.4	156.6	178.2	171.3	98.8	78.5	91.9	72.3	72.3
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:27 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL
RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1946

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	688.0	696.9	695.4	714.3	728.2	680.4	629.2	583.4	505.0	410.4	376.1	445.0	445.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	35.2	28.1	42.0	37.5	8.1	17.6	59.4	31.0	.1	3.1	20.4	31.1	31.1
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:28 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1947

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	433.4	471.0	520.0	547.4	575.0	608.8	567.3	507.1	406.9	302.2	244.7	231.6	231.6
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	34.5	45.4	58.4	65.5	50.7	.1	2.5	.1	.1	.1	16.3	24.6	24.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:30 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1948

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	253.0	269.2	294.0	313.2	337.4	413.0	562.7	555.6	505.2	408.3	337.6	271.7	271.7
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	28.6	29.0	33.7	39.8	39.4	52.9	86.0	54.8	7.7	8.0	19.5	17.7	17.7
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:31 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1949

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	251.2	261.3	299.5	468.7	554.4	731.7	858.7	879.8	844.2	755.8	713.9	654.8	654.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	44.2	85.9	39.5	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	19.2	21.9	25.8	70.6	103.5	160.4	178.2	178.2	147.7	129.8	96.2	80.9	80.9
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:33 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1950

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	665.4	676.0	691.4	707.4	734.2	773.5	723.3	661.4	553.9	456.8	392.5	346.1	346.1
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	66.8	63.2	54.2	50.4	65.0	13.0	16.1	.1	.1	11.5	15.0	15.6	15.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:34 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1951

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	328.9	335.9	341.0	353.1	364.7	374.7	346.2	314.3	241.3	159.2	233.1	202.5	202.5
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	16.5	16.3	22.3	28.3	23.6	.1	4.6	6.2	.1	.1	70.4	78.8	78.8
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:36 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1952

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	210.6	224.5	321.3	820.3	868.4	1071.6	1380.2	1472.4	1446.8	1336.6	1245.1	1142.9	1142.9
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	4.9	124.8	124.8	124.8	124.8	68.8	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	2.7	74.1	135.7	.0	.0	.0	.0	.0	212.5
BARTLETT EOM	62.1	66.0	160.4	177.6	178.2	178.2	178.2	178.2	144.0	91.2	66.3	63.2	63.2
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	42.5	89.8	.0	.0	.0	.0	.0	132.3
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	42.5	89.8	.0	.0	.0	.0	.0	132.3

Date: 3/ 4/1994 Time: 9:15:38 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1953

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1097.1	1113.9	1113.9	1135.9	1148.4	1161.3	1096.2	1037.7	913.0	809.6	706.4	614.2	614.2
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	58.6	44.3	48.8	47.9	13.7	25.5	27.7	.1	.1	.7	19.5	22.0	22.0
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:39 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1954

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	573.6	580.6	570.7	566.7	575.2	667.8	676.3	639.0	582.7	485.7	437.1	379.5	379.5
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	23.2	14.7	21.2	28.6	.1	119.1	117.8	83.0	28.0	37.8	50.3	56.6	56.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:41 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1955

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	384.9	392.1	402.1	414.2	423.9	399.3	360.7	312.1	262.3	202.7	278.1	244.0	244.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	31.0	30.3	24.7	23.8	1.3	16.6	19.1	11.0	.1	13.1	60.3	59.7	59.7
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:42 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1956

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	250.3	259.4	275.1	291.3	318.8	367.4	357.5	323.4	244.1	167.3	116.5	76.6	76.6
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	39.4	38.6	42.3	47.7	41.2	7.1	10.2	1.1	.1	4.6	7.8	5.2	5.2
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:44 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1957

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	68.8	76.0	84.8	200.1	281.6	337.2	322.7	298.7	259.5	166.1	174.6	161.0	161.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	40.5	26.5	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	.1	2.0	5.2	85.5	160.4	160.4	176.1	155.0	113.0	114.7	103.7	71.5	71.5
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:45 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1958

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	175.9	204.0	221.2	234.3	286.9	544.6	756.3	784.8	692.1	653.5	618.7	593.3	593.3
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	88.0	112.8	96.6	78.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	50.4	96.2	95.1	96.3	124.5	160.4	178.2	178.2	178.2	154.7	98.9	101.3	101.3
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:47 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1959

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	636.5	650.0	664.1	676.5	689.1	626.2	555.8	503.3	418.9	330.2	350.6	303.4	303.4
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	69.4	65.6	53.5	44.9	23.8	36.6	38.2	12.2	.1	6.0	33.3	32.2	32.2
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:48 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1960

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	337.3	429.2	673.9	910.5	984.0	1210.6	1260.1	1241.4	1191.4	1073.1	962.6	870.4	870.4
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	19.2	15.0	78.8	43.5	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	64.7	70.7	139.4	160.4	160.4	160.4	178.2	167.8	88.6	63.8	63.8	68.9	68.9
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:50 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1961

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	881.7	892.3	882.7	877.9	885.5	827.4	772.8	714.4	605.4	498.1	439.8	402.3	402.3
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	30.4	20.6	24.6	30.4	.1	6.5	24.2	.1	.1	.1	8.8	21.7	21.7
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:51 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1962

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	381.4	397.5	429.2	511.5	654.6	795.0	1001.4	1017.4	967.0	838.6	733.0	654.6	654.6
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	22.7	20.4	30.5	39.1	108.4	106.2	114.1	65.5	.1	.1	.1	2.6	2.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:53 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1963

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	627.9	629.7	624.4	626.4	670.8	643.9	614.6	573.0	473.1	376.4	413.6	416.3	416.3
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	6.0	9.5	16.7	24.3	30.9	36.3	36.9	5.5	.1	.1	44.0	60.6	60.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:54 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1964

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	434.7	453.9	467.9	479.3	488.9	452.3	462.4	427.4	374.2	299.5	269.6	277.5	277.5
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	33.1	31.2	26.2	26.5	11.5	23.3	82.7	68.4	34.1	34.5	84.7	77.9	77.9
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:15:56 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1965

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	293.9	305.1	320.2	482.7	582.5	725.8	926.6	941.7	861.2	835.2	818.6	759.1	759.1
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	6.6	50.7	124.8	105.4	80.6	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	156.6	.0	.0	.0	.0	.0	156.6
BARTLETT EOM	52.2	48.9	46.9	136.4	160.4	160.4	178.2	178.2	178.2	163.6	97.5	84.4	84.4
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	106.3	.0	.0	.0	.0	.0	106.3
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	106.3	.0	.0	.0	.0	.0	106.3

Date: 3/ 4/1994 Time: 9:15:57 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1966

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	764.5	802.9	1376.6	1488.0	1533.9	1571.7	1571.7	1571.7	1528.3	1412.4	1320.2	1241.1	1241.1
SPILL RELEASE	.0	.0	.0	.0	.0	74.1	52.6	.0	.0	.0	.0	.0	126.7
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	372.8	372.8	364.5	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	43.4	.0	.0	.0	.0	.0	.0	43.4
HORSESHOE EOM	.0	.0	124.8	124.8	110.4	124.8	124.8	59.7	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	80.0	58.3	.0	69.1	4.9	.0	.0	.0	.0	.0	212.3
BARTLETT EOM	43.0	109.7	178.2	178.2	160.4	178.2	178.2	178.2	135.6	84.0	65.7	61.2	61.2
VERDE SPILLS @ BARTLETT	.0	.0	59.4	41.2	.0	40.5	.0	.0	.0	.0	.0	.0	141.1
SPILLS AT GRANITE REEF	.0	.0	59.4	41.2	.0	83.9	.0	.0	.0	.0	.0	.0	184.5

Date: 3/ 4/1994 Time: 9:15:59 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1967

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1200.8	1212.8	1236.5	1251.2	1260.9	1205.4	1165.8	1112.9	1049.0	930.5	901.1	844.4	844.4
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	43.8	33.5	.6	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	57.9	37.9	160.4	160.4	160.4	154.7	115.7	66.5	.1	.1	10.3	15.8	15.8
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16: 1 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1968

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	809.3	806.8	911.2	1093.6	1328.5	1462.3	1540.7	1565.7	1524.7	1416.2	1343.6	1240.6	1240.6
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	75.3	124.8	124.8	68.1	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	2.4	25.6	.0	.0	.0	.0	.0	28.0
BARTLETT EOM	18.2	22.0	77.9	131.9	160.4	178.2	178.2	178.2	147.7	99.7	85.8	77.0	77.0
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16: 2 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1969

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1199.8	1210.8	1204.8	1308.9	1315.3	1324.2	1372.5	1377.2	1328.3	1215.7	1116.9	1087.3	1087.3
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	33.9	67.8	124.8	124.8	65.8	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	36.6	42.4	.0	.0	.0	.0	.0	79.1
BARTLETT EOM	73.5	54.3	51.4	160.4	160.4	178.2	178.2	178.2	157.7	126.9	120.9	79.8	79.8
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16: 4 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1970

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1096.9	1114.3	1110.3	1107.8	1120.1	1082.4	1040.4	1021.5	910.3	786.5	694.1	691.8	691.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	32.4	23.3	26.9	34.7	.9	47.1	56.7	11.3	.1	.1	11.1	95.0	95.0
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16: 5 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1971

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	704.5	714.1	727.1	742.5	755.3	693.9	623.5	574.0	491.7	391.0	371.1	343.1	343.1
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	60.8	58.2	49.7	45.3	16.1	24.2	27.8	13.8	.1	.1	20.5	22.5	22.5
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16: 7 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1972

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	473.0	520.6	633.8	679.6	699.4	728.8	686.9	634.8	528.6	405.7	307.2	234.8	234.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	33.5	37.1	107.6	118.1	105.7	61.8	44.0	6.1	.1	.1	7.2	8.3	8.3
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16: 8 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL
RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1973

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	583.4	687.9	826.8	905.2	1124.5	1571.7	1571.7	1571.7	1571.7	1499.4	1401.0	1296.0	1296.0
SPILL RELEASE	.0	.0	.0	.0	.0	6.9	380.8	344.8	16.2	.0	.0	.0	748.8
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	372.8	372.8	372.8	372.8	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	5.7	350.2	271.1	.0	.0	.0	.0	627.0
HORSESHOE EOM	99.6	124.8	124.8	124.8	124.8	124.8	124.8	124.8	27.7	.0	.0	.0	.0
SPILL RELEASE	.0	24.4	68.5	22.1	67.4	201.0	317.6	5.9	.0	.0	.0	.0	706.8
BARTLETT EOM	178.2	178.2	178.2	178.2	178.2	178.2	178.2	178.2	178.2	157.1	132.2	121.5	121.5
VERDE SPILLS @ BARTLETT	.0	13.1	54.6	11.7	48.8	164.4	292.1	4.6	.0	.0	.0	.0	589.4
SPILLS AT GRANITE REEF	.0	13.1	54.6	11.7	48.8	170.1	642.3	275.7	.0	.0	.0	.0	1216.4

Date: 3/ 4/1994 Time: 9:16:10 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL
RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1974

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1251.7	1264.0	1257.9	1268.3	1262.2	1226.0	1200.1	1150.7	1017.8	885.7	785.3	695.1	695.1
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	114.8	94.9	91.5	103.3	84.1	86.7	44.9	.1	.1	.1	2.4	3.7	3.7
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16:12 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1975

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	685.0	704.4	699.5	714.7	707.6	785.1	941.6	996.6	960.7	849.6	743.1	672.3	672.3
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	8.0	22.9	31.5	24.0	32.4	82.3	117.1	75.1	6.5	.1	.3	3.3	3.3
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16:13 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1976

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	639.2	637.0	633.9	632.0	760.0	800.3	830.1	828.0	777.9	674.1	583.8	511.8	511.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	5.7	11.0	19.8	27.2	156.4	116.6	138.2	100.0	36.0	31.2	32.4	39.6	39.6
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16:15 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1977

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	483.9	494.0	505.5	521.8	534.4	501.4	490.3	451.7	381.5	306.1	263.3	232.9	232.9
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	46.4	43.3	34.5	31.9	3.3	9.3	15.1	9.0	.1	.1	7.3	11.7	11.7
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16:16 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1978

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	223.1	234.8	245.7	285.9	455.8	1417.4	1564.9	1568.5	1518.4	1402.8	1303.4	1197.5	1197.5
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	124.8	120.7	59.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	477.8	.0	.0	.0	.0	.0	.0	477.8
BARTLETT EOM	19.6	18.2	18.9	49.0	150.3	178.2	178.2	178.2	136.4	84.4	61.1	51.9	51.9
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	437.0	.0	.0	.0	.0	.0	.0	437.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	437.0	.0	.0	.0	.0	.0	.0	437.0

Date: 3/ 4/1994 Time: 9:16:18 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1979

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1154.1	1307.0	1571.7	1571.7	1571.7	1571.7	1571.7	1571.7	1571.7	1488.3	1392.8	1289.6	1289.6
SPILL RELEASE	.0	.0	187.2	318.3	237.8	349.2	322.7	73.7	13.1	.0	.0	.0	1501.9
LOWER SALT EOM	354.2	354.2	372.8	372.8	372.8	372.8	372.8	372.8	372.8	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	170.9	305.3	209.5	313.3	271.2	3.5	.0	.0	.0	.0	1273.8
HORSESHOE EOM	.0	.0	124.8	124.8	124.8	124.8	124.8	124.8	26.1	.0	.0	.0	.0
SPILL RELEASE	.0	.0	80.3	131.8	32.9	232.0	107.5	5.4	.0	.0	.0	.0	589.8
BARTLETT EOM	45.8	97.3	178.2	178.2	178.2	178.2	178.2	178.2	178.2	152.5	132.9	121.3	121.3
VERDE SPILLS @ BARTLETT	.0	.0	73.4	127.2	28.9	215.9	90.3	.3	.0	.0	.0	.0	536.0
SPILLS AT GRANITE REEF	.0	.0	244.3	432.5	238.4	529.2	361.6	3.8	.0	.0	.0	.0	1809.8

Date: 3/ 4/1994 Time: 9:16:19 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1980

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1247.1	1262.3	1258.2	1450.0	1571.7	1571.7	1571.7	1571.7	1571.7	1474.7	1388.0	1291.7	1291.7
SPILL RELEASE	.0	.0	.0	.0	632.6	145.6	151.8	61.4	.0	.0	.0	.0	991.5
LOWER SALT EOM	354.2	354.2	354.2	354.2	372.8	372.8	372.8	372.8	359.8	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	616.3	116.1	107.8	.0	.0	.0	.0	.0	840.2
HORSESHOE EOM	.0	.0	.0	87.0	124.8	124.8	124.8	124.8	25.1	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	595.5	152.5	86.0	6.7	.0	.0	.0	.0	840.7
BARTLETT EOM	116.2	98.0	97.7	160.4	178.2	178.2	178.2	178.2	178.2	159.6	133.8	125.5	125.5
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	604.5	123.2	61.1	.0	.0	.0	.0	.0	788.8
SPILLS AT GRANITE REEF	.0	.0	.0	.0	1220.8	239.3	168.9	.0	.0	.0	.0	.0	1629.0

Date: 3/ 4/1994 Time: 9:16:21 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1981

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1256.4	1278.4	1277.3	1272.8	1264.3	1241.0	1266.7	1240.9	1146.8	1017.9	921.4	836.3	836.3
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	120.0	99.5	97.4	109.2	101.5	111.0	83.4	33.9	.1	.1	3.6	9.1	9.1
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16:23 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1982

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	821.9	837.6	834.0	891.6	1015.2	1255.8	1329.1	1346.8	1303.3	1189.9	1097.5	1069.7	1069.7
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	124.8	111.1	60.0	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	21.5	.0	.0	.0	.0	.0	.0	21.5
BARTLETT EOM	29.5	23.5	34.6	42.6	122.7	178.2	178.2	178.2	153.4	124.1	122.2	77.9	77.9
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16:37 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL
RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1991

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	307.4	324.9	404.6	539.6	583.0	1154.8	1357.7	1401.2	1368.1	1254.5	1151.5	1062.9	1062.9
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	.0	67.0	122.3	58.7	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
BARTLETT EOM	30.2	28.5	30.0	49.2	39.6	160.4	178.2	178.2	137.4	89.4	69.6	68.1	68.1
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Date: 3/ 4/1994 Time: 9:16:39 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL
RESERVOIR EOM STORAGES & SPILLS
UNITS: 1,000 AC-FT
DATA YEAR: 1992

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1019.9	1035.9	1072.6	1152.7	1323.9	1483.1	1571.7	1571.7	1571.7	1463.7	1465.6	1377.8	1377.8
SPILL RELEASE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
LOWER SALT EOM	354.2	354.2	354.2	354.2	354.2	354.2	366.5	372.8	355.5	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HORSESHOE EOM	.0	.0	.0	.0	1.4	124.8	124.8	91.3	.0	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	.0	.0	85.1	43.6	.0	.0	.0	.0	.0	128.8
BARTLETT EOM	67.2	57.1	71.8	92.9	160.4	178.2	178.2	178.2	173.6	126.0	162.2	157.0	157.0
VERDE SPILLS @ BARTLETT	.0	.0	.0	.0	.0	24.6	.0	.0	.0	.0	.0	.0	24.6
SPILLS AT GRANITE REEF	.0	.0	.0	.0	.0	24.6	.0	.0	.0	.0	.0	.0	24.6

Date: 3/ 4/1994 Time: 9:16:40 COE WATER CONTROL STUDY: 1995 SYSTEM & DEMAND/NCS/COE INFLOW WITH LOCAL INFL

RESERVOIR EOM STORAGES & SPILLS

UNITS: 1,000 AC-FT

DATA YEAR: 1993

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
ROOSEVELT EOM	1325.3	1325.6	1473.1	1571.7	1571.7	1571.7	1571.7	1571.7	1566.1	1457.1	1360.2	1272.9	1272.9
SPILL RELEASE	.0	.0	.0	1033.3	582.0	287.1	210.0	26.7	.0	.0	.0	.0	2139.1
LOWER SALT EOM	354.2	354.2	354.2	372.8	372.8	372.8	372.8	372.8	354.2	354.2	354.2	354.2	354.2
SALT SPILLS AT ST MTN	.0	.0	.0	1022.2	563.3	247.7	151.8	.0	.0	.0	.0	.0	1985.0
HORSESHOE EOM	.0	.0	50.8	124.8	124.8	124.8	124.8	124.8	24.7	.0	.0	.0	.0
SPILL RELEASE	.0	.0	.0	639.4	420.3	152.5	36.5	1.4	.0	.0	.0	.0	1250.1
BARTLETT EOM	162.8	154.6	160.4	178.2	178.2	178.2	178.2	173.2	178.2	149.9	126.0	121.0	121.0
VERDE SPILLS @ BARTLETT	.0	.0	.0	662.6	406.8	133.3	26.4	.0	.0	.0	.0	.0	1229.0
SPILLS AT GRANITE REEF	.0	.0	.0	1684.7	970.2	381.0	178.1	.0	.0	.0	.0	.0	3214.0